CUTHBERT'S

EXERCISES IN ARITHMETIC

PARTS I. AND II.

ANSWERS.

ANSWERS

—TO—

CUTHBERT'S

EXERCISES IN ARITHMETIC

PARTS I. AND II.

FIRST, SECOND, THIRD, FOURTH AND FIFTH CLASSES.

BY

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TORONTO:

THE COPP, CLARK COMPANY, LIMITED.

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PREFACE.

Much care has been taken to *test the accuracy* of the Answers, and it is hoped the mistakes are few; but in the preparation of Answers to so many problems, mistakes may have crept in unnoticed, and any corrections from teachers, using the books, will be thankfully received.

W. N. CUTHBERT.

VERSCHOYLE, *May 1st, 1894.*

ANSWERS.

FIRST CLASS.

Exercise I.

1. 3754.
2. 14105.
3. 15987.
4. 922.
5. 3920.
6. 14944.
7. 44319.
8. 61525.
9. 73311.
10. 797059.
11. 5390.
12. −1139.
13. 785.

Exercise II.

1. 894.
2. 59209.
3. 5322.
4. 6264.
5. 1815.
6. 6600.
7. 1209.
8. 12010.
9. 290.
10. 10893.
11. 3978.
12. 65152.
13. 1909.

Exercise III.

1. 115.
2. 204.
3. 617.
4. 289.
5. 258.
6. 102.
7. 108.
8. 76.
9. 1388.
10. 665.
11. 860.
12. 377.
13. 3065.

Exercise IV.

1. 84 apples.
2. 325 yards; 10 yards farther.
3. 367.
4. 91 cents.
5. 762.
6. Sum = 93586. Diff. = 777326.
7 times.
8. 40 cents.
9. 3 miles.
10. 125.
11. $8.80.
12. 50 rats.
13. 41 cents.

Exercise V.

1. 3279.
2. 3333.
3. 254727.
4. 5031.
5. $6.75.
6. $1.75.
7. 16 marbles.
8. 900.
9. 20 more.
10. 108.
11. 935.
12. 229.
13. $124.97.

Exercise VI.

1. 9.
2. $32.
3. 3980.
4. 999.
5. 12950 pounds.
6. The seven ten-cent pieces. Three of the five-cent pieces. Two of the one-cent pieces.
7. 27 quarts.
8. $1.75.
9. $4.00.
10. 444: four hundred and forty-four.
11. 72720.
12. 56.
13. 530 cents.

Exercise VII.

1. 15.
2. 10 crows.
3. $8600.
4. 34 gallons.
5. 22 years old.
6. $13000.
7. 159.
8. 20 cents.
9. 123 pears.
10. $35 gain.
11. $19.60.
12. 51282.
13. 0.

Exercise VIII.

1. 99.
2. $34.
3. 3 dozen.
4. 270 sheep.
5. 200 feet.
6. 294 bushels.
7. $20.
8. Tim, by 129 points.
9. 1450 hogs.
10. 34 cents.
11. 99 patches.
12. 9.
13. 252.

Exercise IX.

1. 7.
2. $31.20.
3. $30.00.
4. $9.50.
5. 80.
6. $3.55.
7. $39.
8. (*a*) 421, (*b*) 31, (*c*) 173, (*d*) 687 = 1312 total.
9. 3 dozen.
10. 36 apples.
11. Sum = 630; and 630 taken 11 times = 6930.
12. 38 years old.
13. 10 years.

Exercise X.

1. $6.72.
2. 23 cows and 18 calves, or 41 in all.
3. 13 goats.
4. $2,500.
5. 13.
6. 2487 bushels.
7. $7.
8. 19740 cents.
9. 24609.
10. 6978.
11. 25 feet long.
12. Tom, 50, Sam, 44.
13. 18.

SECOND CLASS.

Exercise I.

1. 12994 ; 19416 ; 25888.
2. 3374 ; 5061 ; 6748.
3. 19608 ; 29412 ; 39216.
4. 24164 ; 30205.
5. 80664 ; 10080.
6. 34988 ; 43735.
7. 30792 ; 38490.
8. 34588 ; 43235.
9. 8644 ; 10805.
10. 28656 ; 35820.
11. 16556 ; 20695.
12. 25884 ; 32355.
13. 18512 ; 23140.

Exercise II.

1. 148020.
2. 63530.
3. 137950.
4. 323920.
5. 160985.
6. 312930
7. 143235.
8. 60840.
9. 235695.
10. 423845.
11. 106980.
12. 146085.
13. 40350.

Exercise III.

1. 592584.
2. 129642.
3. 470874.
4. 239202.
5. 444474.
6. 520374.
7. 72984.
8. 251022.
9. 425448.
10. 178026.
11. 77184.
12. 430116.
13. 182436.

Exercise IV.

1. 212842.
2. 501802.
3. 90048.
4. 207697.
5. 496356.
6. 292859.
7. 85148.
8. 607103.
9. 518553.
10. 279069.
11. 549353.
12. 151228.
13. 691348.

Exercise V.

1. 3509368.
2. 1735896.
3. 2534272.
4. 1608544.
5. 3335896.
6. 573584.
7. 678152.
8. 396968.
9. 103736.
10. 615896.
11. 691768.
12. 244864.
13. 175896.

Exercise VI.

1. 2222262.
2. 2151612.
3. 4258926.
4. 6415776
5. 2128239.
6. 3465621.
7. 8869284.
8. 1952856.
9. 6485481.
10. 531540
11. 737721.
12. 888444.
13. 371889.

Exercise VII.

1. 3313917.
2. 6452838.
3. 8862444.
4. 1898172.
5. 7281576.
6. 3600720.
7. 7748523.
8. 7107282.
9. 4384521.
10. 2690640
11. 8178444.
12. 2528676.
13. 6434874.

Exercise VIII.

1. 9865317.
2. 1338678.
3. 8407432.
4. 2386824.
5. 1448678.
6. 4256824.
7. 1338678.
8. 5212504.
9. 2416557.
10. 3616459.
11. 6541557.
11. 2386824.
13. 7877045.

Exercise IX.

1. 10161372.
2. 2566488.
3. 7138272.
4. 3436608.
5. 1441152.
6. 59530452.
7. 25931808.
8. 69219528.
9. 18923796.
10. 34391340.
11. 103766028.
12. 5398523772.
13. 1156610280.

Exercise X.

1. 91648.
2. 108192.
3. 11445928.
4. 63130063.
5. 14056344.
6. 11887680.
7. 33871024.
8. 1121536.
9. 13648648.
10. 19423890.
11. 2773130.
12. 4205625.
13. 652864.

Exercise XI.

1. 1268414.
2. 1286844.
3. 16143440.
4. 4670703.
5. 70132560.
6. 60447504.
7. 10892376.
8. 27076554.
9. 17180020.
10. 34449288.
11. 37982016.
12. 299391552.
13. 49369408.

Exercise XII.

Quotient.	Remainder.	Quotient.	Remainder.
1. 9843843,	1.	8. 4475,	8.
2. 542468,	2.	9. 10153,	5.
3. 321845,	7.	10. 7749,	15.
4. 48016,	2.	11. 3895,	0.
5. 2676,	56.	12. 13792,	9.
6. 36852,	5.	13. 77893,	25.
7. 202623,	0.		

Exercise XIII.

Quotient.	Remainder.	Quotient.	Remainder.
1. 46006,	73.	11. 2018169,	29.
2. 562606,	38.	1009084,	77.
3. 319462,	17.	3587857.	2.
4. 340618,	63.	12. 31285,	19.
5. 315876,	9.	22346,	46.
6. 270830,	21.	67040,	4.
7. 14415,	37.	9776,	100.
8. 2039,	41.	13. 7684,	0.
9. 14236,	3.	1463,	26.
32031,	3.	975,	47.
21354,	3.	569,	20.
10. 91448,	37.		
102879,	37.		
411517.	13.		

Exercise XIV.

Quotient.	Remainder.	Quotient.	Remainder.
1. 5563,	56.	6. 529193,	78.
4945,	45.	7. 311216,	68.
4896,	0.	8. 368940,	87.
2. 251093,	8.	9. 6000,	0.
167395,	20.	10. 4082,	10.
74398,	2.	11. 3317014,	21.
3. 326398,	50.	12. 492896,	14.
4. 103195,	12.	13. 551887,	33.
5. 8354,	0.		

Exercise XV.

Quotient.	Remainder.	Quotient.	Remainder.
1. 7402,	67.	8. 403111,	87.
2. 7308,	31.	9. 272040,	12.
3. 25913,	95.	10. 87064,	31.
4. 299761,	103.	11. 144312,	0.
5. 466306,	86.	12. 87482,	15.
6. 758257,	1.	13. 44742,	126.
7. 717859,	40.		

Exercise XVI.

Quotient.	Remainder.	Quotient.	Remainder.
1. 57617,	23.	8. 3545520,	4.
2. 65313,	29.	9. 16672,	1.
3. 38860,	67.	10. 9421,	126.
4. 107715,	10.	11. 534476,	54.
5. 26352.	58.	12. 211891,	28.
6. 76681,	0.	13. 75645,	90.
7. 642857,	85.		

Exercise XVII.

Quotient.	Remainder.	Quotient.	Remainder.
1. 39017,	27.	8. 51934,	2.
2. 118622,	6.	9. 53249,	103.
3. 54218,	18.	10. 203290,	21.
4. 659322852,	6.	11. 13850,	14.
5. 827552,	1.	12. 2464121,	19.
6. 50020,	12.	13. 71521,	11.
7. 164400,	31.		

Exercise XVIII.

Quotient.	Remainder.	Quotient.	Remainder.
1. 6471216,	0.	8. 2996008,	2.
2. 75229,	26.	9. 1173268,	5.
3. 2365816,	5.	10. 7553932,	2.
4. 52852,	52.	11. 875066,	65.
5. 1432085,	11.	12. 526183,	1.
6. 1734859,	25.	13. 376228,	49.
7. 1204464,	52.		

Exercise XIX.

Quotient.	Remainder.	Quotient.	Remainder.
1. 821375,	0.	8. 64732,	0.
2. 210604,	0.	9. 64732,	0.
3. 3852224,	0.	10. 82641,	0.
4. 92841,	0.	11. 246071,	0.
5. 496283,	0.	12. 94716,	0.
6. 720684,	0.	13. 100020,	0.
7. 64732,	0.		

Exercise XX.

Quotient.	Remainder.	Quotient.	Remainder.
1. 417343,	7.	8. 18377625,	16.
2. 1778073,	12.	9. 1585658,	24.
3. 1420169,	3.	10. 2752426,	11.
4. 637170,	31.	11. 47166,	25.
5. 24691,	1.	12. 2567866,	26.
6. 25665243,	8.	13. 909814,	57.
7. 32716027,	7.		

Exercise XXI.

Quotient.	Remainder.	Quotient.	Remainder.
1. 144001,	11.	8. 137279,	70.
2. 400202,	4.	9. 919562,	59.
3. 1272824,	28.	10. 51515,	100.
4. 6515789,	37.	11. 140295,	141.
5. 36365,	179.	12. 120837,	161.
6. 131810,	104.	13. 187474,	431.
7. 53177,	461.		

Exercise XXII.

1. 11450926081.
2. 4763, 763, and 63.
3. Prod. 679995, Quot. 28333, Rem. 3.
4. (6790095 + 6799950) = 13590045.

5. 0.	8. 4337801976.	11. 76560696.
6. 36000000.	9. 346290.	12. 12544.
7. 1.	10. 117809316.	13. 53703736.

Exercise XXIII.

1. 846790.
2. 23796.
5. 6272.
6. 432.
7. 137616.
3. 1076.
4. Quot. 1140, and Rem. 84.
8. 166842.
9. 19965.
10. 386.
11. 65727.
12. 1000.
13. 37016056.

Exercise XXIV.

1. 4288.
2. 30030.
3. 243.
4. Q. 4379334, Rem. 5.
5. 480522.
6. Q. 181, Rem. 2.
7. Q. 1714, Rem. 2.
8. 2085136.
9. 16188894.
10. 1296.
11. 116907.
12. 2823529444.
13. 250702.

Exercise XXV.

1. 535210.
2. 194481.
3. 141408.
4. 60339852.
5. 29887.
6. 0.
7. 34622368.
8. 16393.
9. 20364708.
10. 14211450.
11. 4623992.
12. 640715347.
13. 1016760240.

Exercise XXVI.

1. 284089.
2. 226800.
3. 6085176840.
4. 119377476.
5. 64831244095.
6. 8532.
7. 2052892179.
8. 29441476.
9. 426409.
10. 3390859584.
11. 92413568016.
12. 28684.
13. 20041020.

Exercise XXVII.

1. 19006659.
2. 5206152.
3. 3111696.
4. 5475883.
5. 93799225.
6. 9459328.
7. 8576.
8. 99359.
9. 1411344.
10. 725271.
11. 38432240.
12. 12777954.
13. 9698960565.

Exercise XXVIII.

1. 50625.
2. 8512357.
3. 555696.
4. 697.
5. 425663.
6. 9370.
7. 54717954.
8. 3774.
9. 1045.
10. 86508.
11. 149.
12. 339889.
13. 6084.

Exercise XXIX.

1. 1530816.
2. 9999.
3. 4336248.
4. 9185868.
5. 4841284.
6. 14112.
7. 52023040.
8. 1567088363556.
9. 2936.
10. 28536768.
11. 1907082.
12. 9058.
13. 55553208.

Exercise XXX.

1. 35711.
2. 34771072.
3. 2221.
4. 9999.
5. 27888961.
6. 661146642.
7. 2231481.
8. 12312559.
9. 40698996.
10. 1477.
11. 105266.
12. 1070.
13. 61556810.

Exercise XXXI.

1. 4630206.
2. 11737752.
3. 1224492412.
4. 100761444.
5. 42150827803.
6. 19238673250.
7. 45504.
8. 412780489.
9. 1.
10. 41242084.
11. 51380224.
12. 384048.
13. 70227.

Exercise XXXII.

1. 725760.
2. 43545600.
3. 341397504.
4. 783820800.
5. 381024000.
6. 0.
7. 12933043200.
8. 4004453376.
9. 100590336.
10. 90512634401280.
11. 6619748849150976.
12. 13830292869120.
13. 23298085122481.

Exercise XXXIII.

Quotient.	Remainder.	Quotient.	Remainder.
1. 7251,	161.	8. 465,	481.
2. 300,	214.	9. 27,	472.
3. 114389,	655.	10. 482,	276.
4. 676,	502.	11. 2,	2846.
5. 132,	2879.	12. 337,	4536.
6. 292013213,	0.	13. 441,	0.
7. 2787,	432.		

Exercise XXXIV.

1. 905.
2. 4474800.
3. 384120.
4. 7656250000.
5. 540720.
6. Q. 356, Rem. 480.
7. 58112128.
8. Q. 179, Rem. 15.
9. Q. 11, Rem. 0
10. Q. 987, Rem. 0.
11. 4000. Four thousand.
12. 409600.
13. 1769880.

Exercise XXXV.

1. 4179.
2. 4179.
3. Q. 36, Rem. 28.
4. Q. 100, Rem. 21.
5. Q. 96, Rem. 14.
6. Q. 846, Rem. 2.
7. Q. 7400, Rem. 0.
8. Q. 7400, Rem. 0.
9. Q. 4625, Rem. 0.
10. Q. 4625, Rem. 0.
11. 638.
12. Q. 5, Rem. 375.
13. Q. 84, Rem. 0.

Exercise XXXVI.

Quotient.	Remainder.	Quotient.	Remainder.
1. 1858530,	0.	8. 942362,	2.
2. 4978381,	7.	9. 3020495,	1.
3. 405154,	3.	10. 1059558,	7.
4. 5267005,	0.	11. 153370,	25.
5. 635747,	8.	12. 285852,	0.
6. 2922355,	4.	13. 248917,	20.
7. 16043480,	0.		

Exercise XXXVII.

Quotient.	Remainder.	Quotient.	Remainder.
1. 48554,	27.	8. 64092,	16.
2. 185923,	26.	9. 65365,	79.
3. 10969,	47.	10. 107548,	69.
4. 122320,	30.	11. 42586,	77.
5. 30604,	0.	12. 95643,	70.
6. 61126,	13.	13. 1010511,	11.
7. 516136,	71.		

Exercise XXXVIII.

Quotient.	Remainder.	Quotient.	Remainder
1. 5531508,	0.	8. 1300886,	0.
2. 17641,	10.	9. 303370,	0.
3. 159256,	29.	10. 73263,	20.
4. 40314,	94.	11. 14932,	17.
5. 511664,	25.	12. 1473761,	29.
6. 340624,	13.	13. 43231,	0.
7. 662991,	10.		

Exercise XXXIX.

1. 2895487110.
2. 432568386800.
3. 48756366663674.
4. 204156229823.
5. 6871030404.
6. 6070540788.
7. 6952049676.
8. 627797385540.
9. 2240015076756892.
10. 410434286910.
11. 136392592.
12. 42916621885924.
13. 183478853167.

Exercise XL.

1. 5903322673239.
2. 354745872.
3. 372990016.
4. 419067188440.
5. 28795699513879.
6. 185738603076738.
7. 33092477328.
9. 2952728040.
8. 893395000.
10. 19153891608.
11. 91132497.
12. 348753392.
13. 45080187334.

Exercise XLI.

1. 26991937287.
2. 226198688334.
3. 304027838880.
4. 91316467600370352.
5. 201567589160.
6. 10052451302944.
7. 304027838880.
8. 47150560.
9. 3388146771660.
10. 662532486624.
11. 501278276876.
12. 6901032768.
13. 2602480320.

Exercise XLII.

Quotient.	Remainder.	Quotient.	Remainder.
1. 2406,	59.	8. 987,	0.
2. 30079,	0.	9. 8704,	0.
3. 2683298199,	96.	10. 9989,	179.
4. 2450935884,	71.	11. 89769,	0.
5. 600403,	0.	12. 1106610667,	3916.
6. 92943,	22970.	13. 7698,	0.
7. 8794000,	0.		

Exercise XLIII.

Quotient.	Remainder.	Quotient	Remainder.
1. 90366,	83660.	8. 4831,	6723.
2. 712981,	8.	9. 13076,	55.
3. 5263,	2686.	10. 4065502,	18444.
4. 479,	0.	11. 2042225,	87.
5. 977623768356,	50.	12. 144108,	234.
6. 117042881,	124.	13. 79370000,	0.
7. 4590064,	0.		

Exercise XLIV.

Quotient.	Remainder.	Quotient.	Remainder.
1. 864795,	0.	8. 1701790,	281.
2. 9760,	0.	9. 56665,	63.
3. 2715,	0.	10. 90809,	0.
4. 594,	101.	11. 79000,	0.
5. 59835,	21339.	12. 420597,	0.
6. 35700,	1.	13. 37169,	1857.
7. 337863,	79.		

Exercise XLV.

Quotient.	Remainder.	Quotient.	Remainder.
1. 3754394,	16.	8. 456654,	0.
2. 480440,	60.	9. 610821,	13.
3. 402722,	37.	10. 210045,	30.
4. 367770,	2.	11. 34706,	0.
5. 120074,	5.	12. 22546,	50.
6. 1066353,	0.	13. 6849729,	27.
7. 1103312,	37.		

Exercise XLVI.

1. 116581345962900.
2. Q. 4567, Rem. 0.
3. Q. 35045035, Rem. 0.
4. Q. 6600, Rem. 0.
5. Q. 352000, Rem. 0.
6. 554768.
7. 111.
8. 1854.
9. Q. 4071348, Rem. 0.
10. 15460624.
11. 119369.
12. 37094189.
13. 24511.

Exercise XLVII.

1. Q. 435, Rem. 337.
2. 3902.
3. 105.
4. 43148322=product.
5. Q. 2380, Rem. 389.
6. 108.
7. 41440.
8. Q. 651, Rem. 448.
9. 402730.
10. Q. 208474, Rem. 37710.
11. Q. 2796, Rem. 7596.
12. 111.
13. Q. 10982532, Rem. 0.

Exercise XLVIII.

1. 2154111.
2. 24086904710898.
3. 543072641726?9.
4. 56689665.
5. 27699.
6. 3141309425.
7. Q. 796124, Rem. 0.
8. 334953.
9. 285.
10. 71452731.
11. 62736602436.
12. 286286704560081.
13. 1610219670.

Exercise XLIX.

1. 87 cents.
2. Q. 232284, Rem. 2.
3. 20736795.
4. 104.
5. 13200 steps.
6. 402 bushels ; $281.40
7. $51.06.
8. Q. 7251, Rem. 161.
9. $26.35.
10. 110 bottles.
11. 909.
12. Q. 10024366, Rem. 94.
13. 9900 times, and 100 remains.

Exercise L.

1. 2052 sheep.
2. 34 lbs.
3. 54 sheep.
4. 8112 dozen.
5. $127.26.
6. Product 3346685104 ; Quot. 33885 and 66964 over.
7. $193.69.
8. 98 hogs.
9. 106.
10. 13 nuts.
11. $10.
12. 987.
13. 54.

Exercise LI.

1. 204120 ; 28866 ; 164637.
2. Q. 785, Rem. 993.
3. $150.75.
4. $576 ; 24 cents a quire.
5. 1280.
6. Q. 1107, Rem. 17850.
7. $231.
8. 2501100121.
9. 1001.
10. 41.
11. 36.
12. $39.26.
13. $25,000.

Exercise LII.

1. $672.
2. $333.84.
3. $180.
4. 162854.
5. $210.
6. 40997992.
7. 45 pair.
8. $7.60.
9. 332 yards.
10. 707 dozen.
11. $128.04.
12. 189000000.
13. 2615 miles.

Exercise LIII.

1. 888.
2. $(2799)^2 = 7834401$.
3. \$24.08.
4. 100.
5. 10 cents.
6. Q. 21659971776, and 160 over.
7. Sum 1904791.
8. Sum 9380177135.
9. 24 dozen and 3 peaches.
10. 6237.
11. \$15.
12. 182 lbs.
13. 4020.

Exercise LIV.

1. Q. 9816, Rem. 161.
2. Sum of squares = 506109.
3. 6297 times.
4. \$89.10.
5. 6315.
6. Q. 1350, Rem. 128.
7. 18400.
8. Nine hundred and ninety-eight thousand, nine hundred and ninety-nine.
9. 230932 sum.
10. Q. 3029, Rem. 0.
11. \$60.
12. 12600 yards.
13. 17780.

Exercise LV.

1. 33029.
2. 4922 sum; 4864 difference; 141897 product; 168 quotient, and 21 remainder.
3. \$249.60.
4. Q. 1635, Rem. 100.
5. \$19.28.
6. 2970478560, Product; Q. 83720; Rem. 0.
7. 61440.
8. 5450 and 3020.
9. 45140.
10. 10560.
11. $(3597 - 3488) = 109$.
12. \$19.
13. (*a*) \$46.44; (*b*) Q. 43.

Exercise LVI.

1. (*a*) Q. 1114435, Rem. 4.
   (*b*) Q. 1340, Rem. 9.
   (*c*) Q. 19988141, Rem. 0.
2. 300 feet, or 100 yards.
3. \$839.00.
4. \$202.50.
5. (*a*) Q. 48258, Rem. 15.
   (*b*) P. 421796956.
   (*c*) Q. 9700, Rem. 58.
6. \$90; \$15,390.
7. 18309; 4882613.
8. $70604 \times 5005 = 353373020$.
9. \$86.25.
10. $(13364 \times 1049) = 14018836$.
11. \$1540.
12. 80 days.
13. \$54.19.

Exercise LVII.

1. $10.03.
2. Q. 407090, Rem. 0.
3. Q. 6135451, Rem. 0.
4. 35201.
5. $13.01.
6. (*a*) 1824186, (*b*) 79228058, (*c*) 946065750 = 1027117994, sum.
7. 1666 days.
8. 40 dozen.
9. 19 cents.
10. Q. 3902.
11. 1428574.
12. 250 pigs.
13. 672.30.

Exercise LVIII.

1. $3.50.
2. 97 hills.
3. 81.
4. 52787.
5. 1542.
6. 3225600.
7. $1.00.
8. 576 pennies.
9. 203.
10. 11 times.
11. $71.33.
12. $96.32.
13. 180 yards.

Exercise LIX.

1. 1860.
2. $34.30.
3. $13.50.
4. Q. 408445, Rem. 0.
5. $184.86.
6. $57.23.
7. Q. 2776525, Rem. 5.
8. 27.
9. 2061.
10. 734.
11. $19.
12. (*a*) Q. 4703, Rem. 11.
    (*b*) Q. 1078, Rem. 201.
13. 16 seconds.

Exercise LX.

1. (95493 × 94119) = 8987705667; and 8987705667 ÷ 138 = Quotient 65128301, Remainder 129.
2. 20 times.
3. 41 pair.
4. 1547 lbs.; and $495.04.
5. $95.
6. Q. 53550, Rem. 0.
7. 511.
8. $20 a head.
9. Q. 623, Rem. 1235.
10. $6.60.
11. 5623009.
12. Cannot add these. Why?
13. 99 fish.

Exercise LXI.

1. 36120.
2. $504.
3. $3288.60.
4. 98700604686.
5. 2220.
6. 16557726 and 30 over.
7. 50 lambs.
8. No difference. (Identities; each 174300).
9. 6639240.
10. 281644.
11. 34 dresses; 1 yard more.
12. $30 a head.
13. $65.

Exercise LXII.

1. $288.
2. (*a*) 198; (*b*) 5053212.
3. $2.75.
4. 19.
5. $394.
6. Twenty millions twenty thousand and twenty; and 7707.
7. 13075.
8. 2602480320.
9. $960.
10. 436305.
11. 99 days.
12. $3626.
13. $24 gain.

THIRD CLASS.

Exercise I.

1. 20829731/2 feet.
2. 423294 inches.
3. 1 acre, 92 sq. rods, 15 sq. yards.
4. 370242 inches.
5. 4729334 sq. feet.
6. 1805170185 sq. feet.
7. 25 sq. rods, 7 sq. yds., 4 sq. ft., 108 sq. inches.
8. 19 acres, 157 sq. rods, 8 sq. yds., 4 sq. ft., 108 sq. inches.
9. 7 ac. 2 sq. rods, 18 sq. yds., 2 sq. feet.
10. 207 rods, 2 yds., 1 ft., 10 inches.
11. 142704 inches.
12. $6750.
13. 33 miles, 725 yards.

Exercise II.

1. 7 miles 300 rods, 1 foot.
2. 7 miles, 144 rods, 2 yards.
3. 3 miles, 115 rods, 1 foot, 6 inches.
4. 2 acres, 6 sq. rods, 9 sq. yds., 4 sq. ft., 72 sq. inches.
5. 51 lbs., 10 dwts.
6. 3 tons, 9 cwt., 3 qrs., 6 lbs., or 3 tons 981 lbs.
7. 22 miles, 124 rods, 4 yds., 2 ft., 9 inches.
8. 41296.
9. 15 miles, 188 rods, 1 ft., 5 inches.
10. 13 miles, 30 rods, 2 yds.
11. 3 miles, 262 rods, 5 yds.
12. 4. miles, 96 rods, 3 yds, 2 ft., 3 inches.
13. 16 miles, 194 rods, 3 yds, 1 foot.

Exercise III.

1. 201 rods, 1 yd., 1 ft., 6 inches.
2. 12 sq. rods, 1 sq. yard, 7 sq. ft., 64 sq. inches.
3. 14 acres, 32 sq. rods, 13 sq. yds.
4. 103 sq. rods, 11 sq. yds., 36 sq. inches.

5. 2 acres, 42 sq. rods, 18 sq. yds., 4 sq. ft., 72 sq. inches.
6. 10 acres. 158 sq. rods, 9 sq. yds., 1 sq. ft., 28 sq. inches.
7. 18 sq. rods, 28 sq. yds., 1 sq. ft., 77 sq. inches.
8. 53 sq. rods, 28 sq. yds., 32 sq. inches.
9. 1 mile, 5 fur., 4 yds.
10. 1 fur,. 35 per., 4 yds., 1 ft. 6 inches.
11. 36 miles, 247 rods, 2 yds., 1 ft., 6 inches.
12. 6421 feet.
13. 258 acres, 82 sq. per., 29 sq. yds., 4 sq. ft., 72 sq. inches.

Exercise IV.

1. 16 tons, 450 lbs.
2. 44 lbs., 10 ozs., 15 dwts., $11\frac{1}{9}$ grs.
3. 15 acres, 105 sq. rods, 4 sq. yds., 3 sq. ft., 95 in.
4. 89 miles, 135 rods, 4 yds., 1 ft., 6 in.
5. 22 acres, 145 sq. rods.
6. 60 tons, 1585 lbs., 8 ozs.
7. 27 tons, 1338 lbs., 12 ozs.
8. 233 cubic yds., 3 cubic ft., 214 cubic in.
9. £30.
10. 1 acre, 40 sq. rods, 2 sq. yds., 4 sq. ft., 45 sq. inches.
11. $138.60.
12. $385.44.
13. 5 miles, 269 rods, 15 feet.

Exercise V.

1. $(32230)^2 = 1038772900$.
2. 31527.
3. Q. 2721, Rem. 0.
4. 5687136.
5. 454381.
6. 280 apples.
7. 71358296.
8. 16638241.
9. $14.00.
10. Fourteen thousand and three.
11. 973.
12. $64.40.
13. 17 tons, 708 lbs., 2 ounces.

Exercise VI.

1. 1468271.
2. 1328 feet.
3. $24.
4. $54.00.
5. $969
6. $14.20.
7. $62.60.
8. $286.80.
9. 75.20.
10. 7 tons, 1000 lbs.
11. $6251.
12. 6840 lbs.
13. $3129.28.

Exercise VII.

1. $22.68.
2. 1 ton, 580 lbs.
3. 587 rods, 8 ft., 3 inches.
4. $7.70.
5. $5.39.
6. $221.70.
7. $137.40.
8. $4.50.
9. 17 tons, 1000 lbs.
10. $1.70.
11. $34.05.
12. $78.75.
13. $275.30.

Exercise VIII.

1. $12.76\frac{1}{2}$.
2. $14.62\frac{1}{2}$.
3. $37.50.
4. $90.00
5. $56.12.
6. 3800 men.
7. 3 pints.
8. 14 tons, 800 lbs.
9. $285.20.
10. 8 cents.
11. $1120.
12. $70.62\frac{9}{10}$.
13. $900.00.

Exercise IX.

1. $33.95.
2. $165.12.
3. $7.87\frac{1}{2}$.
4. $709.83.
5. $199.07.
6. $3015.68.
7. 62 cents.
8. 17 cwt., 40 lbs.
9. 70 lbs.
10. $720.00.
11. $1357.36.
12. 400 yds.
13. $450.

Exercise X.

1. $79.21.
2. $25.91\frac{13}{28}$.
3. $77.625.
4. 270 bush., hemp seed.
5. $136.00.
6. 1980 lbs.
7. $20.79.
8. 3672.
9. 6941 lbs.
10. 2514 lbs.
11. $\frac{11}{24}$ of a cent.
12. $94.71.
13. 18.36.

Exercise XI.

1. 85 cents.
2. $21.28.
3. $9.31.
4. $20.00.
5. $46.25.
6. $975.12.
7. $3,500,000.00.
8. (*a*) $450; (*b*) $675.
9. 5 cents.
10. $27.54.
11. $47.08.
12. $91.05.
13. 75 cents.

Exercise XII.

1. 15 cents.
2. $16.06.
3. 20 yards.
4. 38.31\frac{39}{56}$.
5. $161.50.
6. $975.12.
7. $22.50.
8. $191.50.
9. $67.65.
10. 46.54\frac{1}{2}$.
11. $450.31.
12. $3693.27.
13. $862.53.

Exercise XIII.

1. $64.61.
2. $50.28.
3. $18.51.
4. $25.53.
5. $22.29.
6. $38.87.
7. $22.48.
8. $30.08.
9. $65.00.
10. $25.21.
11. $67.32.
12. $82.85.
13. $654.50.

Exercise XIV.

1. $91.83.
2. 145 pairs.
3. $544.32.
4. $481.70.
5. $51.12.
6. $32.94.
7. $55.16.
8. 269 tons, 1000 lbs.
9. $374.40.
10. $103.93.
11. $3.15.
12. 3687 apples.
13. $110.20.

Exercise XV.

1. $5.86.
2. 392.
3. $117.75.
4. $74.10.
5. $35.78.
6. $6.55.
7. $73.45.
8. $26.63.
9. $9.25.
10. $46.48.
11. $73.18.
12. $24.68.
13. $254.75.

Exercise XVI.

1. $28.96.
2. $23.49.
3. $768.58.
4. $3.73.
5. $6.40.
6. 109 sheep.
7. $196.55.
8. $9.80.
9. $19.67.
10. $69.81.
11. $98.47.
12. $4.80.
13. $10.08.

Exercise XVII.

1. $70.02.
2. 324 dozen.
3. $100.46.
4. $56.37.
5. $56.01.
6. $273.
7. $41.36.
8. $26.96.
9. $208.40.
10. $30.00.
11. $40.50.
12. $97.20.
13. $5.63.

Exercise XVIII.

1. $20.89.
2. $35.86.
3. 36 5-cent pieces.
4. $27.45.
5. $26.25.
6. 53 yds.
7. $78.00.
8. $10.09.
9. 208 lbs., 8 ozs.
10. $87.30.
11. $4.48.
12. $49.53.
13. $637.

Exercise XIX.

1. $231.44.
2. $8.00.
3. $48.97.
4. $53.04.
5. $60.00.
6. $80.68.
7. $88.64.
8. $6.00.
9. $52.04.
10. $133.06.
11. $37.44.
12. $76.09.
13. 48 cents.

Exercise XX.

1. $123.55.
2. $207.45.
3. $113.12.
4. $37.38.
5. $35.45.
6. $64.25.
7. $7988.69.
8. 55 cents a lb.
9. $7.07.
10. $16.20.
11. $139.43.
12. $13.20.
13. $\frac{5}{512}$.

Exercise XXI.

1. $163.88.
2. $155.79.
3. $160.00.
4. $94.59.
5. $1226.67.
6. $584.06.
7. 27 hats.
8. 3 cents.
9. 65 lbs.
10. 72 cents.
11. 65 dozen.
12. $14.19.
13. $39.32.

Exercise XXII.

1. $120.
2. $1005.
3. 250 miles.
4. $58.32.
5. $20.
6. $583.68.
7. 3738406.
8. $82.
9. $3.90.
10. 519 ponies.
11. 35 cords.
12. $2706.87\frac{1}{2}$.
13. 3 hrs., 20 minutes.

Exercise XXIII.

1. The boys by $52.
2. 1375023660.
3. 7706307420.
4. 12764.
5. $55.44.
6. 16 tons, 1600 lbs.
7. (*a*) $12.20 ; (*b*) $17.08 ; (*c*) $58.56.
8. $160.
9. (*a*) Q. 83448, Rem. 95.
   (*b*) Q. 206, Rem. 0.
   (*c*) Q. 225, Rem. 0.
10. 1.
11. $220.16.
11. $30.72.
12. Q. 1411262913333, Rem. 125.

Exercise XXIV.

1. 36 and 6.
2. $36.36.
3. 48 cents.
4. 3375 tons.
5. 69988069989.
6. 111773.
7. 75 cents.
8. 0.
9. $371.
10. Theory.
11. 336.
12. 90 yards.
13. 789.

Exercise XXV.

1. $42.
2. $40.
3. $15.32.
4. $720.
5. $14, first.
   $29, second.
   $6, third.
6. 1298460 L.C.M.
7. $237.60.
8. 1352 yards.
9. $8004.00.
10. $25000.00.
11. $28.20.
12. 576 yards.
13. $140.

Exercise XXVI.

$640.
2. 600 days.
3. $698.25.
4. (*a*) Digging post-holes ;
   (*b*) $29.12.
5. $101.00.
6. $3253.75
7. $66.00.
8. $15.00.
9. $.45 gain.
10. 126 doz. and 8 apples.
11. A $105 ; B $72.
12. First $1.85 ; second $1.65 ;
    third $1.50.
13. $12000.00.

Exercise XXVII.

1. $360.
2. $225.00.
3. $100.
4. $423.50.
5. 99 acres, 20 sq. rods.
6. 2061.
7. (*a*) $76.65 ; (*b*) 12 lbs., 8 ozs.
8. $70.65.
9. $15000.00.
10. $58\frac{1}{2}$.

    $71\frac{1}{2}$.
11. $333.36.
12. $56.25.
13. (*a*) 2100.00 ; (*b*) 12 sh., 1d.

Exercise XXVIII.

1. $126.63.
2. 3 miles per hour.
3. $70 gain.
4. $225.
5. 78 miles, 232 rods.
6. $33.30.
7. $5425.
8. $486.78.
9. 6.
10. $2^3 \times 3^2 \times 5 \times 7$; $2 \times 3 \times 5 \times 7 \times 11 \times 13$; $2^4 \times 3^4$; $2^3 \times 3^2 \times 7 \times 11$.
11. 26 gallons, 1 quart ; 20 barrels.
12. 25 cents per lb.
13. A $3.00 ; B $9.50 ; C $12.50.

Exercise XXIX.

1. 2052.
2. 1260.
3. 6930.
4. 30240.
5. 29.
6. 131.
7. 1221.
8. 454.
9. $\frac{13}{14}$; $\frac{3}{5}$.
10. $\frac{4}{5}$; $\frac{3}{7}$.
11. $\frac{8}{9}$; $\frac{23}{25}$.
12. $\frac{6}{17}$; $\frac{17}{401}$.
13. $\frac{21}{22}$; $\frac{55}{57}$.

Exercise XXX.

1. 18.
2. $\frac{11}{64}$.
3. $4\frac{11}{120}$.
4. 22.
5. (*a*) $\frac{16}{119}$; (*b*) $\frac{46}{63}$.
6. (*a*) 5 ; (*b*) $\frac{101}{117}$; (*c*) 1.
7. 3.
8. 5776.
9. 20.
10. 13.
11. 1.
12. 453492 ; $\frac{3}{4}\frac{4}{5}\frac{1}{3}\frac{5}{4}\frac{5}{5}\frac{7}{7}$.
13. $1\frac{1}{5}$; $\frac{3}{84}$.

Exercise XXXI.

1. 69088 ounces.
2. 1 mile, 94 rods, 3 yds.
3. $4.77.
4. 46 acres, 142 sq. rods.
5. By steamboat, by 104 rods.
6. 11 gallons, 2 quarts.
7. 61 acres, 40 sq. rods.
8. 18 gallons, 2 quarts.
9. 21 miles, 165 rods, 4 yards, 2 feet, 6 inches.
10. 23 bush., 2 pks., 1 gal., 2 qts.
11. 1628 parcels.
12. 12 days.
13. 121 posts.

Exercise XXXII.

1. Q. 216, Rem. 0.
2. 2^7 ; $2^2 \times 3^4$; $2^2 \times 3^2 \times 7$; $2^2 \times 5 \times 43$; $3^2 \times 11^2$; $2^2 \times 3^2 \times 5 \times 7$.
3. 672 ounces.
4. 79020 inches.
5. $330.00.
6. $24,750.
7. $2.25.
8. $17.50.
9. $2.16.
10. 2249775.
11. $700 gain.
12. $371.10.
13. $15.00 a ton.

Exercise XXXIII.

1. 20 acres, 97 sq. rods, 15 sq. yards, 3 sq. feet, 3 sq. inches.
2. 2193 lbs., 12 ozs.
3. $400.00.
4. 61 bushels, $34\frac{4}{5}$ lbs.
5. $\frac{5}{8}$ of a ton, or $166\frac{2}{3}$ lbs.
6. 22680.
7. 13.
8. $39.12.
9. 20 barrels.
10. $4080.00.
11. 45 pairs.
12. A $16 ; B $15.
13. 37 tons, 1025 lbs.

Exercise XXXIV.

1. 1.
2. $70.
3. $\frac{5}{64}$.
4. $.20.
5. 38 acres.
6. 1440.
7. $121.
8. $29.20.
9. 30 hours.
10. $2.50.
11. 36.
12. $\frac{1}{3}$.
13. A $350 ; B $420 ; C $560.

Exercise XXXV.

1. $752.
2. 19 acres, 29 sq. yards, 5 sq. feet, 90 sq. inches.
3. $47.52 gain.
4. $5760.
5. $147.
6. $21.65.
7. $4.23.
8. 20 cords
9. $131384009\frac{2601}{6111}$ times.
10. 36 tons.
11. $117.
12. $545.75.
13. 1185 bushels, 30 lbs.

Exercise XXXVI.

1. $7.93.
2. 3665 lbs.
3. $3.
4. $94.53.
5. 315,462,206,805,518.
6. $.98.
7. 871.
8. (*a*) $1885.68; (*b*) $558.72.
9. $205.
10. $\left\{\begin{matrix}\text{Wood, } \$229.50\\ \text{Coal, } \$210.00\end{matrix}\right\}$ Coal by $19.50.
11. 73 miles, 240 rods.
12. $1747.20.
13. 60 cents.

Exercise XXXVII.

1. $2160.
2. $52.50.
3. $4.93.
4. $60.13.
5. 60 tons, 1585 lbs., 8 ozs.
6. 1760.
7. 9375 bags.
8. $27.50.
9. $5.00.
10. $8.40.
11. 150.
12. 4 bushels, 5 qts.
13. $4.06.

Exercise XXXVIII.

1. 96 cords.
2. $864.
3. $451.
4. 240 lbs., 10 ozs.
5. 1,493,284.
6. $46.80.
7. $403.20.
8. $311.04.
9. $20.
10. 2^4 acres, 28 rods, 10 yds.
11. 568 times.
12. $747.05.
13. $167.87.

Exercise XXXIX.

1. $6906.25.
2. $30.72.
3. 16 days.
4. $25.20 gain.
5. 240 dozen.
6. $1512.
7. 9860.
8. 421 lbs., 1 ounce.
9. $52.10.
10. 28 dozen.
11. $4.80.
12. $315.
13. $46.13.

Exercise XL.

1. $35.28.
2. $587.00.
3. $500.00.
4. 13 hrs., $42\frac{6}{7}$ minutes.
5. $1314.
6. $434.24.
7. 2898 acres, 127 rods, 15 yds., 1 foot, 18 inches.
8. 31 cents.
9. $5.25.
10. 806 yds., 1 foot, 4 inches.
11. 14322420 inches.
12. 720 fathoms.
13. (*a*) 80 rods ; (*b*) 177120.

Exercise XLI.

1. 1600 rods.
2. 400 turkeys.
3. $159.46.
4. $518 gain.
5. $8.25.
6. $764.73.
7. 7684 and 978.
8. 24511.
9. 13 bushels, 32 lbs.
10. $44,000.00.
11. $11,088.00.
12. $29.70.
13. $210.68.

Exercise XLII.

1. $67.50.
2. $1710.50.
3. 142704 inches.
4. (*a*) 116200 ; (*b*) 1 mile, 266 rods, 4 yds., 2 ft., 4 inches.
5. 1500 fathoms.
6. 806 yds., 1 foot, 4 inches.
7. 3 days, 23 hours, 30 minutes.
8. 480.
9. $260.19.
10. Q. 4032.
11. $26.50.
12. 13 days.
13. Q. 23872, Rem. 73.

Exercise XLIII.

1. 14,322,708 sq. inches.
2. 11 acres, 123 rods, 17 yds., 5 feet, 72 inches.
3. $40.00 gain.
4. $18.72.
5. $14.67.
6. 54 lbs.
7. $259\frac{7}{9}$ time.
8. 18 hrs, 20 minutes, 24 sec.
9. $109,800.00.
10. 40 chains.
11. $550.00.
12. £60 (Stg.)
13. 923 bushels.

Exercise XLIV.

1. 188 times.
2. 1280 lbs.
3. 2nd day ; 8 cents more.
4. $17.70.
5. $1512.00.
6. 5 cents ; $1.20.
7. $19.98.
8. $76.80.
9. $450.00.
10. 12 bushels, 30 lbs.
11. $1.50.
12. 16 miles.
13. 65 bushels.

Exercise XLV.

1. 61 acres, 96 rods, 26 yds., 6 feet, 108 inches.
2. 1485.
3. $8 a head.
4. $5 a head.
5. 127 barrels.
6. 10,560 times.
7. A, $7.00 ; B, $5.60 ; C, $12.60.
8. $34.79½.
9. 784 loaves.
10. $8.00.
11. $1.92.
12. ½ a bale (20 pieces).
13. $111.92.

Exercise XLVI.

1. 23 cents.
2. $259.20.
3. $327.60.
4. $3150.00.
5. $600 ; $50.
6. 165 acres.
7. 125 acres, 65 sq. rods, 7 yds., 4 feet, 108 inches.
8. $3,939,196.80.
9. $96.84⅔.
10. 71 minutes, 174 rods, 5 yds., 1 foot, 2 inches.
11. 1 shilling, 10d.
12. 10 days longer.
13. 630.

Exercise XLVII.

1. $45.00 gain.
2. 819674 sq. feet.
3. 817,947.
4. 6336 times.
5. 406 head.
6. $92.64.
7. 320 cords ; $2.50 left.
8. $131.53.
9. 1 cent.
10. Q. 2,042,225, Rem. 87.
11. 32.
12. 20.01.
13. $4560.00.

Exercise XLVIII.

1. (*a*) 2^4, 3, 5 ; (*b*) 2, 3^2, 5^2 ; (*c*) 2^2, 5^2, 7^2.

2. (*a*) 24336; (*b*) 10700514.

3. 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45.

4. 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80.

5. Composites 21, 39, 40, 63, 81, 84, 99: Primes 7, 13, 19, 29, 41, 53, 79.

6. (*a*) $\left\{\begin{matrix}1\times24\\2\times12\\3\times8\\4\times6\end{matrix}\right\}$; (*b*) $\left\{\begin{matrix}1\times27\\3\times9\end{matrix}\right\}$; (*c*) $\left\{\begin{matrix}1\times54\\2\times27\\3\times18\\6\times9\end{matrix}\right\}$.

7. 6300 L.C.M.

8. L.C.M. 45045 : Quotients $\left\{\begin{matrix}6435\\5005\\4095\\3465\\3003\\2145\end{matrix}\right\}$: Sum 24148.

9. 13 bushels, 1 gallon.

10. 28, H.C.F.

11. (*a*) $\frac{13}{15}$; (*b*) $\frac{4}{5}$; (*c*) $\frac{13}{14}$.

12. 81 bags ; 5 marbles.

13. 72 ; $\left\{\begin{matrix}72 & 432\\144 & 504\\216 & 576\\288 & 648\\360\end{matrix}\right\}$.

Exercise XLIX.

1. 7560 L.C.M.
2. 5040 L.C.M.
3. 63756 L.C.M.
4. 6 H.C.F.
5. 74 H.C.F.
6. 81 H.C.F.
7. (L.C.M.) $18018\div$(G.C.M.) $= 182$ times.
8. $3\frac{1}{3}$.
9. 5.
10. 2025.
11. 6.
12. \$5553.84.
13. (*a*) $\frac{1}{4}$; (*b*) $\frac{3}{5}$; (*c*) $\frac{83}{120}$.

PART II.

FOURTH AND FIFTH CLASSES.

FOURTH CLASS.

Exercise I.

1. $90; B $600; C $300.
2. 15 minutes.
3. $6\frac{7}{9}$ days.
4. $53\frac{1}{3}$ per cent.
5. 31 lbs.
6. $140.
7. $155.52.
8. $185,600,' 00.
9. 70 dozen.
10. $63.
11. $\frac{1}{15}$ of an ounce.
12. $\frac{19}{230}$.
13. 450 times.

Exercise II.

1. $6750.
2. Product 518 acres, 16 rods, 3 ft., 48 inches. Quotient 57 acres, 90 rods, 20 yds., 1 ft., $125\frac{1}{3}$ inches $= 361095029\frac{1}{3}$ inches.
3. (*a*) 50 miles; (*b*) 3168000 inches.
4. 207 rods, 2 yards, 1 ft. 10 inches.
5. $385.
6. 2 inches.
7. $1 .05.
8. ————
9. 25 per cent.
10. $80.
11. $768.
12. $29.60.
13. (*a*) $13.75; (*b*) 99 times.

Exercise III.

1. 660 yds.
2. 6 years.
3. $20.
4. 38 bushels 24 lbs.
5. $666 gain.
6. (*a*) $18\frac{11}{12}$; (*b*) $9\frac{7}{24}$.
7. $6300.
8. $.72 a cwt.
9. $5\frac{2}{5}$ days.
10. $2.92.
11. 31 miles, 219 rods, 4 yds., 1 ft., 3 inches.
12. $27\frac{9}{13}$ min. past VI.
13. (*a*) $6480 loss; (*b*) $\begin{cases} 50 \text{ lbs., } 0 \text{ ozs.} \\ 37 \text{ lbs., } 8 \text{ ozs.} \end{cases}$; (*c*) $189.51.

Exercise IV.

1. 1 mile.
2. 80 rods.
3. $9.60.
4. $65.60 gain.
5. 49 days.
6. 25 gallons.
7. $5.84.
8. H.C.F. 3 inches; L.C.M. 165060.
9. 25 per cent.
10. $61200.
11. $620.
12. 165 feet.
13. $7\frac{1}{7}$ per cent.

Exercise V.

1. 4 lbs.
2. 336 yds.
3. $78\frac{3}{4}$ cents.
4. 45 gallons.
5. $4\frac{1}{2}$ per cent.
6. $192.
7. (*a*) 2552 cub. feet, 1088 cub. inches; (*b*) 1120 sq. feet, 96 sq. inches.
8. 50 per cent.
9. A's $400; B's $700; C's $350.
10. 40 tons, 500 lbs.
11. 112 days.
12. 225 cords.
13. (*a*) $240; (*b*) $902.40; (*c*) $95.10.

Exercise VI.

1. $23\frac{1}{13}$ min. past 5 o'clock.
2. 11. 24 o'clock, or 24 min. past 11 o'clock.
3. $16\frac{4}{11}$ min.
4. (*a*) $21\frac{8}{11}$ min. past 7 o'clock; (*b*) $21\frac{9}{11}$ min. to 8 o'clock; (*c*) $5\frac{5}{11}$ min. to 8 o'clock.
5. $9\frac{3}{13}$ min. to 12 o'clock.
6. 48 min. past 11 o'clock, or 12 min. to 12 o'clock.
7. $4.43\frac{7}{11}$ o'clock p.m.
8. $5\frac{5}{11}$ min. to 11 o'clock.
9. 24 min.
10. $43\frac{7}{11}$ min. after III.
11. $18\frac{6}{13}$ min. past 4 'clock.
12. 4 min.
13. (*a*) In 6 min. 12 seconds; (*b*) in $16\frac{4}{11}$ min.; (*c*) in 24 min.; (*d*) in $32\frac{8}{11}$ min.; (*e*) $49\frac{1}{11}$ min.; (*f*) in 1 hour (at one o'clock); (*g*) in $55\frac{5}{11}$ minutes.

Exercise VII.

1. $10.
2. (*a*) $4.80 ; (*b*) $1.00.
3. $940.
4. $\frac{475}{576}$.
5. $\frac{3}{35}$.
6. 8 bushels.
7. 3 acres, 106 sq. rods, 22 sq. yds., 7 sq. ft., 72 sq. inches.
8. 79.
9. 14 days.
10. $\overline{\text{C}}\text{DLIV}\overline{\text{C}}\text{DXV}$.
11. 1000.
12. $40.
13. (*a*) $823.44 ; (*b*) $40.30.

Exercise VIII.

1. £2, 13 sh., 4d.
2. 12 minutes to 10 o'clock, or 48 minutes past 9 o'clock.
3. 5750 pieces.
4. (*a*) 22 feet, 6 inches ; (*b*) 112.
5. $27.
6. 385 tons.
7. 180 bushels.
8. $2.92. per day.
9. $800.
10. $2294..
11. 100 per cent. gain.
12. 4320 times.
13. (*a*) $85 ; (*b*) $1 ;
    (*c*) 1050 first. 1008 second. 1200 third.

Exercise IX.

1. 320 loads.
2. 45 bushels pease.
3. $500.
4. $4.00.
5. $3600.
6. A $40, B $240, C $360.
7. $25.520.
8. $73.50.
9. $1.75.
10. $100.
11. 35 per cent.
12. $\frac{1}{2}$.
13. $12\frac{1}{2}$ per cent.

Exercise X.

1. $2^2 \times 5 \times 17$; $2^4 \times 5^2 \times 7$; $2^2 \times 5 \times 3 \times 7^2$.
2. $2^2 \times 3^5 \times 5$; $2^2 \times 3 \times 7 \times 71$; $2^2 \times 3^2 \times 5^3$.
3. $2^4 \times 3 \times 5^2 \times 7$; $2^4 \times 239$; $2^2 \times 3 \times 5 \times 23$.
4. $2^4 \times 5^2 \times 11$; $2^5 \times 3^3$; $2^3 \times 3^3 \times 5^2$.
5. $2^5 \times 3 \times 5$; $2^7 \times 5$; $2 \times 3^3 \times 11 \times 13$.
6. $2^3 \times 3 \times 5$; $2^3 \times 3^2 \times 5^2$; $2^2 \times 5^4$.
7. $3^2 \times 5 \times 7 \times 11 \times 13$; $2 \times 3 \times 7 \times 11 \times 19$; $2^3 \times 5^2 \times 7 \times 11$.
8. $3^3 \times 5$; $2^5 \times 3^2 \times 5^2$; $2^2 \times 3^4 \times 5^2$.

9. $2^2 \times 3 \times 5^2 \times 11$; $2^2 \times 5^3 \times 13$; $2^2 \times 3 \times 5^2 \times 13$.
10. $2^3 \times 3^2 \times 5^2$; $2^4 \times 5^2 \times 13$; $2^2 \times 3 \times 5^4$.
11. $2 \times 5^2 \times 23$; $2^3 \times 3 \times 5 \times 47$; $2^2 \times 5 \times 7 \times 13$.
12. $2^2 \times 5^2 \times 3 \times 7$; $2^2 \times 3 \times 5^2 \times 29$; $2^2 \times 5^3 \times 7$.
13. $2^2 \times 5 \times 67$; $2 \times 3^4 \times 5^2$; 7×29^2.

Exercise XI.

1. 11592.
2. 7436429.
3. 720720.
4. 672.
5. 180.
6. 504.
7. 1530.
8. 5040.
9. 18900.
10. 1673196525.
11. 2162160.
12. 3255840.
13. 565081020.

Exercise XII.

1. 510510.
2. 5040.
3. 2520.
4. 8400.
5. 2520.
6. 5019589575.
7. 277200.
8. 28728.
9. 3300.
10. 378000.
11. 864.
12. 1511640.
13. (*a*) 3517800 ; (*b*) 460.

Exercise XIII.

1. 477.
2. 788.
3. 192.
4. 47.
5. 1 (Prime to each other.)
6. 89.
7. 13.
8. 3.
9. 3224.
10. 39.
11. 267.
12. 43.
13. 837.

Exercise XIV.

1. 225.
2. 267.
3. 29.
4. 131.
5. 4.
6. 7.
7. 41.
8. 186.
9. 37.
10. 492.
11. 21.
12. 97.
13. 99.

Exercise XV.

1. 628320.
2. $32340 \div 1617 = 20$.
3. $1680 \div 168 = 10$.
4. $599760 \div 147 = 4080$.
5. $720720 \div 1001 = 720$.
6. $2227680 \div 4641 = 480$.
7. $128 \times 2304 = 294912$.
8. 232792561.
9. $60 \div \frac{5}{48} = 576$.
10. $184\frac{4}{5}$.
11. $1\frac{7}{8}$.
12. 9.
13. (*a*) $\frac{1}{5}$; (*b*) G.C.M. 3; L.C.M. 12; (*c*) 60 cents.

Exercise XVI.

1. $13\frac{1}{20}$.
2. $8\frac{47}{132}$.
3. $\frac{583}{1610}$.
4. $14\frac{9}{10}$.
5. $8\frac{347}{1700}$.
6. $14\frac{7}{9}$.
7. (*a*) $3\frac{5}{9}$; (*b*) $2\frac{26}{51}$; (*c*) $2\frac{347}{525}$.
8. $6\frac{117}{380}$ and $5\frac{67}{91}$.
9. $7\frac{61}{112}$ and $4\frac{11}{28}$.
10. (*a*) $5\frac{7}{24}$; (*b*) $4\frac{1009}{1170}$.
11. (*a*) $\frac{5}{16}$; (*b*) $2\frac{23}{34}$.
12. 3.
13. (*a*) $63\frac{1618}{1659}$; (*b*) 23 sq. yds. 5 sq. ft. 36 sq. inches.

Exercise XVII.

1. (*a*) $11\frac{53}{77}$; (*b*) 100.
2. $1\frac{6}{7}$.
3. 18.
4. $\frac{1}{3}$.
5. $16\frac{1}{4}$.
6. 85.
7. (*a*) $19\frac{1}{5}$; (*b*) $31\frac{4}{21}$.
8. (*a*) 16; (*b*) $1\frac{29}{172}$.
9. $\frac{29}{90}$ and $\frac{16}{30}$.
10. (*a*) $8\frac{256}{2515}$; (*b*) $1\frac{1067}{1860}$.
11. 5; 144; $1\frac{8}{11}$.
12. $\frac{3}{4}$.
13. (*a*) $3\frac{1}{2}$; (*b*) $\frac{1}{63}$.

Exercise XVIII.

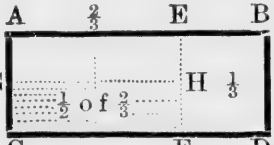
1. 8.
2. $1\frac{1}{2}$.
3. $9\frac{7}{60}$.
4. 2.
5. 6.
6. 2.
7. 1.
8. 1.
9. $\frac{1}{3}$.
10. $5\frac{1}{6}$.
11. $\frac{1}{4}$.
12. 2.
13. $\frac{437}{800}$.

Exercise XIX.

1. $6\frac{2}{5}$.
2. 32 vests.
3. 32.
4. $93\frac{1}{8}$ yds.
5. $3135.
6. $\frac{432,567,528,644}{1008}$; $\frac{53}{252}$.
7. $\frac{11}{4}$ hours.
8. $7\frac{17}{40}$ acres.
9. $13\frac{6}{8}$ lbs., or 13 lbs., 10 ozs.
10. $\frac{7}{80}$.
11. $\frac{17}{1728}$.
12. House, $2100. Lot, $300.
13. (*a*) 1089.
(*b*) 2 quarts, 1 pint.

Exercise XX.

1. $2\frac{2}{3}$.
2. Sum $= 1\frac{59}{60}$; Quotient 7.
3. $\frac{4}{5}$, $\frac{3+4}{4+5}$, and $\frac{3}{4}$.
4. (*a*) L.C.M. 382109; (*b*) $\frac{379}{4618}$.
5. $\frac{3}{5\frac{1}{2}}$.
6. $\frac{16}{5\frac{1}{9}}$.
7. $70\frac{793}{1266}$.
8. 3108.
9. $34\frac{43}{1682}$.
10. (*a*) $\frac{1}{8}$; (*b*) \$480.
11. 1.
12. $\frac{35}{36}$.
13. (*a*) $\frac{1}{22}$; (*b*) $\frac{29}{155}$; (*c*)



= { A C D B = one whole rectangle. A C F E = $\frac{2}{3}$ of the whole. G C F H = $\frac{1}{2}$ of $\frac{2}{3}$ of the whole; = $\frac{2}{6}$ or $\frac{1}{3}$ of the whole rectangle, etc.

(*d*) $\frac{3}{256}$ ac. = 19 sq. rods 6 sq. yds., 64.8 sq. inches; (*e*) 1.

Exercise XXI.

1. 28656 ounces.
2. $13\frac{1}{3}$ dozen.
3. 12 acres, 85 sq. rods.
4. \$1.55.
5. { A 12 days. B 6 days.
6. 3 feet.
7. 15 miles.
8. 5880600 sq. inches.
9. \$4791.12.
10. 142992 cubic inches.
11. 25 per cent.
12. $\frac{73}{77}$.
13. 6240.

Exercise XXII.

1. \$900.
2. \$1540.
3. \$3430.
4. \$5.
5. \$34.28$\frac{4}{7}$.
6. \$1000.
7. \$8100.
8. \$311.11$\frac{1}{9}$.
9. \$60.
10. \$2.50; $3\frac{17}{36}$ cents.
11. 9000 sq. feet.
12. 1800.
13. (*a*) \$49; (*b*) $1\frac{1}{5}$; $1\frac{1}{5} \times \$560.00 = \$672.00$.

Exercise XXIII.

1. $10\frac{2}{5}$ days.
2. $5.
3. $116.34.
4. $\dot{0}3\dot{7}$.
5. $10.
6. $1057.50.
7. The latter, by $10.
8. 1987.
9. $21\frac{9}{11}$ minutes.
10. $19.78.
11. 350 bushels.
12. 1 ton, 1125 lbs.
13. (*a*) $80.64 ; (*b*) 3 days.

Exercise XXIV.

1. $\frac{3}{14}$.
2. A $120, B $105.
3. $4000, and $12\frac{1}{2}$ per cent. loss.
4. $222.
5. A 16 years, B 24 years.
6. A $60, B $80, C $90, D 205, and E $180.
7. 10 miles.
8. $6\frac{1}{4}$ gallons.
9. 54 men.
10. 76400 chains.
11. 27 cub. feet.
12. 4 lbs. green and 10 lbs. black.
13. 587 lbs., 8 ozs.

Exercise XXV.

1. $900.
2. 120 hats.
3. $87.50.
4. 40 per cent.
5. A $22.50 ; B $15.00 ; C 10.00.
6. (*a*) $\frac{4}{5}$; (*b*) $\frac{3}{40}$.
7. $12.00.
8. $99.00.
9. $200.
10. $397.50.
11. 40 per cent.
12. $8.00.
13. $96.86\frac{62}{88}$ an acre.

Exercise XXVI.

1. (*a*) 5 hours ; (*b*) 5 miles.
2. 200 yards.
3. $\frac{1}{18}$.
4. 140 lbs.
5. $60.
6. 200.
7. 105 acres, 128 sq. rods.
8. 15 gallons.
9. $42 safe, $147 contents.
10. 12 feet.
11. $150, $200 and $250 for A, B and C, respectively.
12. $750.
13. 35.

Exercise XXVII.

1. 8.36 o'clock, or 24 minutes to 9 o'clock.
2. 10 rods.
3. 1280 acres.
4. $22\frac{1}{2}$d. per lb.
5. 38 barrels, 127 lbs.; and 25 lbs. in a bag.
6. $152.90.
7. $6.
8. 1 acre, 38 sq. rods, 29 sq. yds., 5 sq. feet, 90 sq. inches.
9. $112.
10. $9.41\frac{7}{13}$ o'clock.
11. 8 days.
12. $143\frac{135}{147}$ per cent.
13. (*a*) 87318 bushels; (*b*) 351 times; (*c*) $126.

Exercise XXVIII.

1. $210.63.
2. $2.50.
3. $2252.25.
4. 602 carats.
5. $14000.
6. 5 dozen.
7. 1000 papers.
8. 1036 acres, 127 sq. rods, 30 sq. yds., 2 sq. feet, 36 sq. in.
9. 4 dozen.
10. $\frac{37}{650}$.
11. 12 o'clock, noon.
12. 405, 360 and 324, respectively.
13. $2,395,800, an acre.

Exercise XXIX.

1. 280 sheep.
2. $900.
3. $7.30 an acre.
4. $4 a cwt.
5. 1400 five-cent pieces; $74.
6. The first, by 763 lbs.
7. $71.28.
8. 27390 feet.
9. 109 feet.
10. (*a*) $\frac{1}{2}$; (*b*) $2\frac{3}{4}$.
11. $37800.
12. $42834.00.
13. 1 foot, 6 inches.

Exercise XXX.

1. 17136 times.

2. (*a*) $(2\times2\times3\times3\times5)$, $(2\times3\times3\times5\times7)$, $(2\times3\times5\times5\times7\times7)$. (*b*) I. G. C. M. $= (2\times3\times5)$ the *greatest* selection of common factors of these numbers $= 30$. II. L. C. M. $= (2^2\times3^2\times5^2\times7^2)$ the *smallest* selection of factors, including the factors of each given number $= 44100$.

3. (*a*) $(3\times5\times7\times13)$ and $(2\times5\times5\times7\times13)$. (*b*) (I.) G. C. M. is equal to $(5\times7\times13)=455$; (II.) L. C. M. is equal to $(2\times5\times5\times7\times13\times3)=13650$. (*c*) (I.) From (*b*) (I.) and (II.) we have G. C. M. × L. C. M. $=(5\times7\times13)\times(2\times5\times5\times7\times13\times3)=(3\times5\times7\times13\times2\times5\times5\times7\times13)$ all the factors of 1365 and 4550; (II.) from (*c*) (I.) we see that G. C. M. is composed of the factors of 1365 and 4550 rejected by L. C. M. and *vice versâ*; (III.) G. C. M. and L. C. M. are made up of all the factors of 1365 and 4550 [*c*. (I.)]; therefore G.C.M. × L. C. M. = product of the two numbers (because G.C.M. and L.C.M.= *all the factors* of the given numbers); (IV.) since G.C.M. × L. C. M. of the two numbers = product of numbers; therefore their product ÷ one of the numbers = the other number, and *vice versâ*; (V.) since product of the two numbers = G. C. M. × L. C. M.; therefore their product ÷ G. C. M. = L. C. M. and *vice versâ*.

4. 180.

5. (Theory).

6. 740.

7. The smallest number we could have for one is 240; therefore, 240 and 2880, or 720 (third multiple) and 960, etc. (N.B. all the multiples of 240 will not do, however).

8. L. C. M. 40; Quot., 525.

9. H. C. F., 5; L. C. M., 30.

10. (*a*) H. C. F., $\frac{1}{108}$; L. C. M., $\frac{3}{4}$; (*b*) 1 and 81 times, respectively.

11. 243,706,050.

12. L. C. M., 90, and H. C. F., $\frac{1}{105}$.

13. 272.

Exercise XXXI.

1. 312 bushels.

2. 4.

3. 50 of each.

4. (*a*) The latter kind by $\frac{1}{28}$ of a cent, per inch. (*b*) 40 sticks of the 7-inch kind.

5. 410 and 615.

6. 4840 times.

7. 21 lbs., $0\frac{7}{8}$ ounces, $(21\frac{7}{128}$ lbs).

8. 650 lbs. at 4, 6 and 8 cents, respectively, and 1560 lbs. at 15 cents.

9. $51\frac{9}{13}\%$.

10. $96.24.

11. $20 cost.

12. $240.

13. (*a*) 514 bushels, 16 lbs.; (*b*) 9600; (*c*) $18.06.

Exercise XXXII.

1. $11\frac{1}{2}$ cents.
2. $3\frac{3}{4}$ ozs.
3. A \$78.32. B \$121.04.
4. 3 : 13.
5. \$4,150,000.
6. 416 sq. ft., 96 sq. inches.
7. \$240.
8. 7 cents.
9. 5 days.
10. \$1613.20.
11. £16, Sterling.
12. \$691.
13. (*a*) 56 cents. (*b*) L.C.M., 90; 73 times.

Exercise XXXIII.

1. A \$4.50. B \$2.00. C \$1.80.
2. 200.
3. \$5,700.
4. 20 per cent.
5. $1\frac{25}{28}$.
6. 210.
7. 22.
8. 567, L.C.M.
9. 357, the greater; and 136, the less.
10. 160 lbs. of the dearer, and 120 of the cheaper.
11. 70 cents.
12. $2\frac{6}{7}$ per cent.
13. (*a*) \$7000 cost, \$8000 asking price, \$7500 selling price; (*b*) \$32.60.

Exercise XXXIV.

1. \$2.
2. November 19th, 1888.
3. 40 per cent.
4. \$200.
5. First cost, \$4; second cost, \$2.
6. \$131.25.
7. 200 bushels.
8. 4 per cent.
9. $66\frac{2}{3}$ per cent.
10. \$6875.
11. (*a*) $57\frac{11}{12}$; (*b*) $35\frac{1}{6}$.
12. 9 years.
13. (*a*) 16 feet; (*b*) 36 years.

Exercise XXXV.

1. $3\frac{1}{2}$ years.
2. 4 per cent.
3. \$1800.
4. 112 barrels, and 560 boxes.
5. 20, 80 and 160.
6. 510 cords, 60 cubic feet.
7. 5166 acres, 119 sq. rods, 6 sq. yds., 2 sq. ft., 36 sq. in
8. \$4800.
9. \$54.
10. \$504.
11. 4 times.
12. G : B : : 2 : 3 (or 120 lbs. green and 180 lbs. black).
13. (*a*) 336; (*b*) \$2.35.

Exercise XXXVI.

1. $607.50 amount (principal and interest).
2. 5 per cent.
3. $12\frac{1}{2}$ years.
4. The latter by $5440.
5. $\frac{1}{4}$.
6. $4.50.
7. $33.75.
8. 5585 miles, 1650 yards.
9. 16 tons, 1860 lbs.
10. 13 acres, 157 sq. rods, 139 sq. yds., 5 sq. feet.
11. $16.20.
12. $.90.
13. 3176 miles, 80 rods.

Exercise XXXVII.

1. 4 per cent.
2. 25 per cent.
3. 3600 men.
4. $57.60.
5. 2640 times.
6. 40 cents.
7. 99 days.
8. $1750.
9. 20 lbs. at 46, 50 and 75 cents, respectively, and 9 lbs. at 80 cents.
10. $38\frac{8}{9}$ per cent.
11. $\$13333\frac{1}{3}$.
12. $92.
13. 104 yds. at $1.80 = $187.20 (practically); 25%.

Exercise XXXVIII.

1. $1880.
2. $327.06.
3. $91\frac{13}{48}$ days.
4. 3 min. per hour.
5. 90 gallons.
6. 31,536,000 seconds.
7. $180.00.
8. 4 months.
9. (*a*) Side measurement, 32 sq. ft. to a cord. (*b*) In tiers lengthwise of the pile.
10. $271.25.
11. 8 lbs. at 50 cents, 5 lbs. at 70 cents.
12. 18 gallons.
13. (*a*) $10; (*b*) 30 cents.

Exercise XXXIX.

1. 4 hrs., 35 min.
2. 150 per cent.
3. 20.
4. 420 sq. inches.
5. $62\frac{8}{11}$ per cent.
6. $24.80.
7. $\frac{1}{2}$.
8. 6732; 1679, sum.
9. $8.
10. $4.20.
11. $75.
12. $22.50.
13. (*a*) 70 tons; (*b*) $384.

Exercise XL.

1. \$2.51⅞.
2. First, 70; second, 140; third, 60.
3. 17136.
4. 10 bags.
5. 1875 bushels.
6. 841.
7. 56 lbs.
8. A, \$9.00; B, \$4.30; C, \$2.90; D, \$12.60.
9. 90 fives; 80 tens.
10. \$1432.32.
11. \$36.50.
12. 113.
13. (*a*) 16 cents; (*b*) A, \$350; B, \$50; C, \$250.

Exercise XLI.

1. \$7000.
2. (*a*) $\frac{1}{8}$; (*b*) $\frac{50}{81}$; (*c*) $\frac{1}{2}$.
3. \$1075.20.
4. 9 miles.
5. \$175.50.
6. $\frac{1}{8}$ of an inch to the mile.
7. 90 cents.
8. $\frac{7}{25}$.
9. 4 per cent.
10. 107 cart-loads.
11. 5200.
12. 80 per cent.
13. 5 p.m.

Exercise XLII.

1. (*a*) 10 minutes; (*b*) 3 miles.
2. 432 days.
3. \$333.
4. 12 days.
5. \$1440.
6. 24762 tons, 1678 lbs., 2 ozs.
7. 2 games.
8. 33⅓ per cent.
9. \$2250.
10. \$216.
11. 16 days.
12. 1¼ per cent. gain.
13. 5 per cent.

Exercise XLIII.

1. (*a*) 80 cents; (*b*) 3⅛ per cent.
2. 2000 gallons.
3. 48 tons.
4. \$156.06.
5. 5 per cent.
6. \$27.50.
7. A, \$40; B, \$120; C, \$180.
8. 2 lbs. 8 ozs.
9. 12 per cent.
10. 15 cents a doz., before; 12 cents a doz., after.
11. \$244.48.
12. 20.
13. \$84.

Exercise XLIV.

1. $1.46.
2. $\frac{34}{75}$.
3. 7 years.
4. A, $81 ; B, $90 ; C, $108.
5. 49 boys.
6. 420.
7. $\frac{1}{2}$.
8. $6.12.
9. $1880.
10. $53.82.
11. November 19th, 1888.
12. 8 hours.
13. $4.00 loss.

Exercise XLV.

1. $737.10.
2. $436.48.
3. 20.
4. $46.30.
5. 20 days, 12 hrs., 48 minutes.
6. 50 per cent.
7. 2254 casks, and $2\frac{2}{3}$ pints left.
8. 24 miles.
9. $41.60.
10. $517.11.
11. $2200.00.
12. 24 miles an hour.
13. 1089.00.

Exercise XLVI.

1. 435.
2. 1120.
3. 40 cents.
4. 2105.
5. $1530.
6. 150.
7. 32.
8. 112.
9. $125 and $280.
10. $\frac{25}{64}$ of a sq. inch.
11. $8688.80.
12. 7:5.
13. (*a*) 6 turkeys, 3 ducks, 2 geese and 2 chickens ; (*b*) £10 14sh. 11d.

Exercise XLVII.

1. $\frac{1}{225}$.
2. Yes ; because it is the measure of a quantity.
3. Due Dec. 13th, 1891, but must be paid on the 16th Dec. (3 days' grace) ; $654 will redeem it.
4. $1.55.
5. 5.
6. A, $560.00 ; B, $784.00 ; C, $1120.00.
7. $180.00.
8. 132.
9. 42.
10. $1287.45.
11. $420.
12. 25 per cent.
13. (*a*) 840 ; (*b*) 1 ft. 4 in.

Exercise XLVIII.

1. \$146000.00.
2. A \$14.00 ; B \$70.00 ; C \$28.00.
3. 13 sq. feet, 153 sq. inches.
4. A $\begin{cases} 20\frac{55}{144} \text{ gallons of wine.} \\ 9\frac{89}{144} \text{ gallons of water.} \end{cases}$
   B $\begin{cases} 9\frac{89}{144} \text{ gallons of wine.} \\ 10\frac{55}{144} \text{ gallons of water.} \end{cases}$
5. 750.
6. \$36.00.
7. Sum \$800.00 ;
   Shares $\begin{cases} \text{A's } \$500.00. \\ \text{B's } \$60.00. \\ \text{C's } \$240.00. \end{cases}$
8. 4.
9. $33.33\frac{1}{3}$ less.
10. $73\frac{1}{2}$ cents.
11. 18 lbs., 12 ozs.
12. \$90.
13. (*a*) 504 rails ; (*b*) 515 yds.

Exercise XLIX.

1. \$122.88.
2. 115 yards.
3. 12 horses ; 108 sheep.
4. 100 gallons.
5. 8 per cent.
6. 700.
7. $2\frac{3}{11}$.
8. 81.
9. 66 trees.
10. $13\frac{1}{3}$ % gain.
11. 135 ounces.
12. 660 times.
13. $\begin{cases} 20 \text{ lbs. at } 60 \text{ cents.} \\ 30 \quad \text{“} \quad \text{“} \quad 70 \quad \text{“} \end{cases}$

Exercise L.

1. \$11,900.00.
2. 80.
3. 7,115,505.
4. \$183.
5. $\begin{cases} \text{A. } \$118.80 \\ \text{B. } \$1608.00 \end{cases}$ Total, \$1726.80.
6. \$145.71.
7. $8\frac{4}{7}$ per cent.
8. 32 dozen.
9. $37\frac{1}{7}$ per cent.
10. 7×907 ; $2^2 \times 3^2 \times 5^3$; $2^8 \times 5^2$.
11. 35.
12. $\begin{cases} 64\frac{1}{8} \text{ min.} \\ 32\frac{1}{16} \text{ “} \end{cases}$
13. $\$246.31\frac{3}{7}$.

Exercise LI.

1. A, \$36 ; B, \$48 ; C, \$49.
2. \$16.
3. $1\frac{7}{96}$.
4. Clay, 60 feet; sand, 12 feet; rock, 18 feet.
5. 13 days.
6. 28.
7. 5040.
8. 5 days.
9. Both (*a*) and (*b*) Theory ; (*c*) (I.) $\frac{32}{99}$; (II.) 62 ; (*d*) (I.) 9091; (II.) 61 ac., 96 rods, 26 yds., 6 ft. 108 in.
10. \$103,000.
11. \$.2.
12. A, \$615 ; B, \$1025.
13. 40 cents.

Exercise LII.

1. 560 acres.
2. 60 per cent.
3. 2.
4. 5 lbs.
5. −$60. (He is $60 in debt.)
6. (*a*) 71 ; (*b*) 1,244,880.
7. A, 60 days ; B, 330 days.
8. $\cdot 027045$.
9. $100.
10. 2880 times.
11. Lose, $1400.
12. 25 ft. 6 in. long ; 17 ft. 0 in. wide.
13. (*a*) $91.26 ; (*b*) 28 cents.

Exercise LIII.

1. $1 25.
2. $200.
3. $\$649.97\frac{193}{256}$.
4. $6864.
5. $5\frac{1}{5}$ cents.
6. $677.60.
7. $28.75.
8. $44.00.
9. $764.00.
10. $32.
11. 242.
12. $497.61.
13. 114.

Exercise LIV.

1. $80 per annum.
2. $8500.00.
3. (*a*) $\frac{1}{8}$; (*b*) $\frac{41}{108}$.
4. 17 days.
5. 40 days.
6. $192.
7. A, $480 ; B, $360.
8. $3.
9. $\frac{29}{44}$.
10. $\$170 \cdot 555264$.
11. 40 barrels.
12. $-\frac{463}{1355360}$.
13. (*a*) $189.00 ; (*b*) $75.60.

Exercise LV.

1. A, $242.10 ; B, $121.05.
2. The ninth $= 9 \times 450 = 4050$.
3. $7\frac{1}{2}$ per cent.
4. 28000.
5. 1048 yds.
6. $560.
7. $400, first ; $350, second.
8. 225 bushels.
9. 2 tons, $913\frac{1}{18}$ lbs.
10. L.C.M. 40320 ; H.C.F. 133.
11. $15.48.
12. 456 bushels.
13. (*a*) $12.75 ; (*b*) 15 acres.

Exercise LVI.

1. 18 times.
2. 43 tons, 400 lbs.
3. 704 bushels.
4. $2154.27.
5. $2 tons.
6. $54.45.
7. A : B : : 45 : 32.
8. $4375.
9. $1.05.
10. 5.
11. 330.03\frac{3}{4}$.
12. 121.21\frac{7}{8}$.
13. $7.00 gain.

Exercise LVII.

1. 45 sheep.
2. $320.00.
3. 4 per cent.
4. $963.90.
5. $192.50.
6. $1\frac{5}{27}$.
7. $81.60.
8. $8.00.
9. 23 H.C.F.: and 211 L.C.M.
10. $19.80+$33.75 = $53.55.
11. $1\frac{1}{15}$ of cost.
12. $9405.
13. (*a*) 34.56 ; (*b*) $18.

Exercise LVIII.

1. $\frac{1}{4}$.
2. $20.00.
3. (*a*) $\frac{43}{88}$; (*b*) $\frac{45}{88}$; (*c*) 1.
4. $28\frac{4}{7}\%$.
5. 117,612 tons.
6. 2 tons, 56 lbs.
7. $84.00.
8. $4.80 (80 cents each).
9. $31,500.00.
10. $\frac{39}{97}$.
11. $3\frac{1}{2}$.
12. 20 miles.
13. $1000.

Exercise LIX.

1. $30.00.
2. The former ; $6.00 saved.
3. $2\frac{1}{2}$ L.C.M.
4. 35 days.
5. $21.07.
6. 10 years ; 6 per cent.
7. 4 per cent.
8. $30,000.
9. $532. (Quintal=1 cwt.)
10. $13.80.
11. $350.00.
12. 3 days.
13. 60.

Exercise LX.

1. $17.04.
2. First, 176 bushels. Second, 176 " Third, 348 "
3. $1\frac{5}{16}$.
4. $1.60.
5. $107\frac{2}{21}$.
6. A, 800; B, 300.
7. $\frac{4}{25}$ of a ton.
8. 6,198,089,008,491,993,412,800.
9. A, $32.00; B, $30.00.
10. 870 bbls.
11. 4 acres.
12. 15·83.
13. $280.

Exercise LXI.

1. $34.40.
2. $\frac{4}{65}$; $2400.00.
3. 32 days.
4. A, 450; B, 400.
5. $125.
6. 1 ton, 625 lbs.
7. $38.70.
8. $240.
9. $1400.
10. $\frac{3}{5}$.
11. $40.
12. 80 dozen.
13. (*a*) Gains 10 per cent.; (*b*) 27 times.

Exercise LXII.

1. $270,000.00.
2. A, $480; B, $160; C, $640.
3. $24.00.
4. $73.60.
5. 243.
6. $153.60.
7. $27,375.
8. 408 yards.
9. 8%.
10. B, $1.02; G, $2.04.
11. 45 gallons.
12. $87.50.
13. 1, 4, 3 and 2 lbs. resp., (or 1 lb. of each, for another set.)

Exercise LXIII.

1. $13\frac{1}{2}$.
2. 81 tons.
3. $1300.
4. 20 per cent.
5. $6 a head.
6. 60 miles.
7. $360.
8. 1 day.
9. 117,628.
10. $1364.
11. 8.
12. 5.20 p.m.
13. (*a*) 110 sq. inches; (*b*) 1005$\frac{1}{7}$ sq. inches; (*c*) 2354 sq. inches.

Exercise LXIV.

1. 154 sq. inches.
2. 10 feet, 6 inches.
3. 56 yards.
4. 1886 sq. yards, 4 sq. feet, 72 sq. inches.
5. 8 acres, 23 rods, 8 yards, 2 feet, 36 inches.
6. $\pi(80^2 - 60^2)$ sq. inches $= 3\frac{1}{7}\ (140 \times 20)$ sq. inches $=$ 6 sq. yds., 7 sq. feet, 16 sq. inches.
7. 1078 cubic inches.
8. 1121·12 + . . . sq. inches.
9. 891 cubic inches.
10. 20 inches.
11. 42 rods.
12. 20 inches.
13. (*a*) 9 feet, 4 inches; (*b*) 44 sq. rods, 6 sq. yards, 6 sq. feet, 72 sq. inches.

Exercise LXV.

1. $60.
2. $1261.40.
3. $165.12.
4. 8 : 5 respectively.
5. $230.
6. (*a*) of, first; ÷, second; ×, third; (*b*) $3\frac{51}{175}$.
7. (*a*) $\frac{25}{189}$, (*b*) $\frac{175}{243}$, (*c*) $\frac{21}{25}$.
8. $50\frac{10}{33}$ days.
9. 303 dozen and 4, chairs.
10. He would neither gain nor lose.
11. $120.
12. $\frac{348}{360}$, $\frac{87}{360}$, $\frac{75}{360}$; $1\frac{5}{12}$.
13. 10 years.

Exercise LXVI.

1. (*a*) $9\frac{1}{2}$; (*b*) $9\frac{1}{2}$.
2. $6.00.
3. Either *directly* North or South.
4. $121.70.
5. 7800 miles.
6. 9 acres, 52 rods, 24 yards, 3 feet $21\frac{3}{5}$ inches.
7. 21,315 lbs.
8. $2707.20.
9. $133.20.
10. 1st, 205; 2nd, 328; 3rd, 4th, 5th, 123 each.
11. $160.70.
12. $390.
13. (*a*) $8\frac{1}{2}$; (*b*) 48 cents, tea; 40 cents, coffee.

Exercise LXVII.

1. 1.
2. $1.26.
3. $9\frac{1}{11}$ lbs.
4. 45 sheep.
5. 733 yds., 1 ft.
6. $4\frac{1}{5}$ hours.
7. 1 pint.
8. At A's corner; once. (But A will have reached his corner the second time).
9. Horse, $240; carriage, $400.
10. $560.
11. 630.
12. 20 per cent.
13. 7 inches.

Exercise LXVIII.

1. (*a*) Book-work; 3341520; (*b*) 17; 3rd, 4th, 5th, 6th, 7th, 8th, and 9th.
2. (*a*) Book-work; (*b*) $\$14.37\frac{1}{2}$; (*c*) 25 per cent.
3. (*a*) Book-work; (*b*) 150 barrels.
4. 75 cents.
5. July 13th, 1890.
6. 2 days.
7. 7.
8. Book-work; $375 \cdot \dot{7}0\dot{4}46355\dot{}$.
9. (*a*) $32; (*b*) 104 days.
10. $46.71.
11. 11 dozen.
12. 67.
13. $60, A's share; $50, B's share and $36, C's share.

Exercise LXIX.

1. 5 days.
2. 4 hrs., 22 min., 30 sec.
3. $4.50.
4. 13 miles.
5. 4 lbs.
6. $26\frac{1}{2}$ per cent.
7. $\frac{1}{8}$ of an acre.
8. 13 lbs., 8 ozs.
9. $43,200.
10. (*a*) 2,505,600 sec's.; (*b*) 7 times.
11. A, $70; B, $80.
12. 664 lbs.
13. $16,044.

Exercise LXX.

1. 80 yards.
2. 45 acres.
3. 63 cents.
4. $2400.
5. $3942.
6. $60.
7. A, $100; B, $150; C, $250.
8. $13500.
9. 1st, $600; 2nd, $1200; 3rd, $900; 4th, $2700.
10. 192.85\frac{5}{7}$.
11. 147 sq. rods, 0 sq. yds., 8 sq. ft., 90 sq. in.
12. 70 times.
13. $86.69.

Exercise LXXI.

1. 28 per cent.
2. 50 lbs. and 37$\frac{1}{2}$ lbs.
3. $221.
4. $902.40.
5. 300.
6. 80 per cent.
7. $40.30 gain.
8. 244 acres, 88 rods, 24 sq. yards, 2 sq. feet, 72 sq. inches.
9. A $400; B $87.50, and $262.50.
10. (*a*) $10; (*b*) £3, 3s, 3d.
11. $18.90.
12. 37.

13. (*a*) 28512; (*b*) (I.) By the '*local value*' of a digit is meant its value *according to the position it occupies* in our scale (decimal scale) of NOTATION. (II.) First its *real* or *intrinsic* value as the number 7 (7 times the unit); and second, its '*local value*' in the TENS' PLACE (7 tens, or 70 TIMES *the unit*). (III.) $\overline{\text{CX}}\text{L}\overline{\text{IC}}\text{L}\overline{\text{XXX}}\text{I}\overline{\text{CM}}\text{XXIV}$.

Exercise LXXII.

1. (*a*) Book-work; (*b*) 247; (*c*) $\cdot\dot{1}4285\dot{7}$.

2. (*a*) Finite: Pure Repetend: Mixed Repetend. (If the denominator of a fraction contains *no other factors* than 2 or 5, the decimal is *finite*; if the denominator contains *neither of the factors* 2 or 5 it is a *pure* repetend; but if it contains *either of the factors* 2 or 5 it is a *mixed* repetend.) (*b*) (I.) $\frac{77}{1000}$; (II.) $\frac{5}{91}$; (III.) $\frac{2}{7}\frac{5}{4}\frac{2}{9}\frac{7}{9}\frac{8}{5}$.

3. $\frac{1}{5}$.
4. $610.
5. $10.
6. ·078125.
7. $675.
8. H.C.F., 41; L.C.M., 34,440.
9. $\overline{\text{L}}\text{IXC}\overline{\text{CC}}\text{XXIV}$.
10. $384.
11. $41.25.
12. 101 barrels.
13. 1036 acres, 128 sq. rods.

Exercise LXXIII.

1. 72 gals.
2. $37\frac{1}{2}\%$.
3. The *latter*, by \$1 on \$100.
4. \$17.81.
5. 10 hrs., 48 min., a.m.
6. Length, 27 ft.; breadth, 18 ft.; height, 13 ft.
7. \$4.07.
8. \$240.57.
9. $\frac{2}{5}$.
10. 3 sh. St'g.
11. 2 miles.
12. 7 ft.
13. \$100.

Exercise LXXIV.

1. \$72.
2. Total, 14215.
3. 2 ozs., 13 dwts., 4 grs.
4. \$1313.
5. 60%.
6. (*a*) 3636; (*b*) 81. (☞ Brackets)
7. A, 54; B, 36; C, 60 sheep; \$5 per head.
8. A, \$10; B, \$8; C, \$22; \$2 a day.
9. $15\cdot045\dot{}$.
10. 71 ac., 98 sq. rods, 29 sq. yds., 3 sq. ft., 100 sq. in.
11. $\frac{3}{40}$.
12. \$22.16.
13. \$5.10.

Exercise LXXV.

1. \$604.80.
2. A, 123 lbs., 6 ozs.; B, 164 lbs., 8 ozs.
3. 54 yards; \$2 left.
4. \$23.04.
5. \$2646.
6. \$19.08 gain.
7. 28 hours.
8. 27 acres, 20 sq. rods, 15 sq. yards.
9. 54 minutes.
10. 15 miles.
11. 42 acres, 108 rods, 7 yards, 81 inches.
12. $\left\{\frac{41+(\frac{1}{2} \text{ of } \frac{9}{10})+(\frac{1}{8} \text{ of } \frac{9}{10})}{83\frac{1}{8}}\right\} = \frac{1}{2}$.
13. 236250.

Exercise LXXVI.

1. 216 yds., 2 ft.
2. 5 days.
3. 60 per cent.
4. 240 lbs.
5. 5 per cent.
6. 13 cents.
7. \$43.20.
8. 24 days.
9. 9 cents.
10. 30 lbs.
11. \$967.50.
12. $46\frac{2}{3}\%$.
13. 3 cents.

Exercise LXXVII.

1. 25 cents.
2. \$3872.
3. 32 bbls. at \$4.50 ; 113 bbls. at \$5.00.
4. A, \$90 ; B, \$70 ; C, \$640.
5. 99.
6. 3 dirks.
7. 175 hours.
8. 45 minutes.
9. A, \$180 ; B, \$100 ; C, \$280.
10. $16\frac{2}{3}$ per cent.
11. Tom, \$5.91 ; and Bob, \$3.44.
12. \$55.12 gain.
13. 41 acres, 120 rods, 19 yards.

Exercise LXXVIII.

1. \$43.20.
2. $9{\cdot}41\frac{7}{13}$ p.m.
3. Each man \$15 ; each woman \$5 ; each child \$1.
4. \$81.
5. \$95.
6. 23 lbs.
7. 33.
8. \$360.
9. \$50.
10. A must pay B \$0.50.
11. 486 lbs. $10\frac{2}{3}$ ounces.
12. 67.
13. 492 bushels ; $\frac{14}{41}$.

Exercise LXXIX.

1. \$28.
2. \$48.64.
3. 20.
4. 1522 yards.
5. \$6000.
6. 13 miles.
7. 30 cents.
8. 5 per cent.
9. \$7.20.
10. Note (*face value*), \$584.
11. \$112.
12. \$73.
13. (*a*) \$9210 ;

(*b*) (1), H.C.F. 896 $\left\{\frac{16128}{81536} = \frac{18}{91}\right.$; (2) $\frac{16128}{81536} = \frac{2304}{11648} = \frac{288}{1456} = \frac{18}{91}$;

(3) $\frac{\cancel{7}}{\cancel{16}} \times \frac{\overset{9}{\cancel{72}}}{91} \times \frac{\overset{2}{\cancel{82}}}{\underset{\cancel{8}}{\cancel{56}}} = \frac{18}{91}$

Exercise LXXX.

1. 2 quarts, 1 pint.

2. The *multiplier* $= 1\frac{1}{5}$; $1\frac{1}{5} \times \$560 = \$672$, the amount.

3. $\frac{319}{7632}$ of a lb. troy.

4. 20 per cent.

5. 40.

6. 18 tons.

7. \$700.

8. 10 doz.

9. (*a*) The L.C.M. of *two numbers* consists of the *smallest selection of factors which contains* the factors of each given number ; and the H.C.F. of *two numbers* consists of the *greatest selection of factors common* to both numbers. The H.C.F. is composed of *all the factors rejected* by the L.C.M. and *vice versâ* ; therefore, the *factors* of the H.C.F. and L.C.M. comprise *all the factors of the two numbers ;* and consequently, the H.C.F. multiplied by the L.C.M. is equal to the *product* of the *two numbers, e.g.* :—Question 9 (*b*). H.C.F. and L.C.M. of 2340 and 2520, which *resolved* into their *prime* factors $=$ $\left.\begin{matrix} 2340 = 2\times2\times3\times3\times5\times13. \\ 2520 = 2\times2\times2\times3\times3\times5\times7. \end{matrix}\right\}$ Now, the *greatest selection of factors, common* to these numbers, is $2\times2\times3\times3\times5 = 180$, the H.C.F. ; and the *smallest selection of factors* which CONTAINS the factors of each of the given numbers, is $(2\times2\times3\times3\times5\times13)\times(2\times7)$ $= 32760$, the L.C.M. ; but these *are all the factors* of these two numbers ; therefore the H.C.F. $\times$ L.C.M. of *any two* numbers is the product of the *two* numbers ; $\therefore \frac{\text{H.C.F.} \times \text{L.C.M. of } \textit{any two} \text{ No's.}}{\text{One of the No's.}} =$ the other No. (*c*) $\frac{31\times28520}{713} = 1240$. (*d*) $\frac{38760}{323} = 120$.

10. L.C.M. $= 158230800$; H.C.F. $= \frac{2}{5}$ $\therefore$ $158230800 \times \frac{2}{5} = 35162400$.

11. (I.) \$5.30 ; (II.) \$4.80.

12. A, \$90 ; B, \$60 ; C, \$50.

13. (*a*) A, \$160 ; B, \$150 ; C, \$180. (*b*) A, \$30 ; B, \$20 ; C, \$16.

Exercise LXXXI.

1. 7200.
2. 16 days ; $\frac{1}{8}$ of the work.
3. 10 per cent.
4. 3 cents a pint.
5. 10 per cent.
6. 70×56 rods.

7. In *brackets* $= \{ 4\frac{1}{3} \div (\frac{3}{4} \text{ of } 1\frac{3}{2}) \} + \{ (\frac{5}{6} \text{ of } \frac{3}{4}) \div 2\frac{3}{16} \} - \{ \frac{1}{3} \times (\frac{9}{10} \div 1\frac{7}{20}) \} - \frac{5\frac{1}{9}}{7} = \frac{4\frac{1}{3}}{\frac{3}{4} \text{ of } \frac{1}{4}\frac{3}{2}} + \frac{\frac{5}{6} \text{ of } \frac{3}{4}}{2\frac{3}{16}} - \frac{1}{3} \times \frac{\frac{9}{10}}{1\frac{7}{20}} - \frac{5\frac{1}{9}}{7} = 18.$

8. 20 at \$3.00; 13 at \$0.50.

9. 60 tons.

10. Length, 64 ft.; breadth, 48 ft.; height, 5 ft. 4 in.

11. 12 days.

12. 60 gallons.

13. \$10.50.

Exercise LXXXII.

1. A, 20 days; B, $27\frac{1}{2}$ days.
2. 30.
3. 25 times.
4. \$80.
5. 4 per cent. loss.
6. \$1.20.
7. A, \$180; B, \$240.
8. \$3024.
9. 15 days.
10. \$429.
11. \$9000.
12. 373.06 net.
13. $\frac{5}{8}$ of an inch.

Exercise LXXXIII.

1. Of *all the factors* of the two numbers; hence L.C.M. × H.C.F. = *Product* of the two numbers; 170,690.

2. In the simple rules the *unit* is uniform; in the compound rules it varies; $\sqrt[2]{\left\{\frac{\text{Product}}{\text{Quotient}}\right\}}$ = smaller number = 6,081; and $\sqrt[2]{(\text{Product} \times \text{Quotient})}$ = large number = 1,866,867; 1 lb., 2 ozs., 12 dwts., 10 grs.

3. Same difference as between *simple* and *compound* rules; in decimal fractions the unit is uniform *(decimal scale)*, and in vulgar fractions the unit varies; 2; $13\cdot00069615\dot{}$.

4. (5 strips=2 double rolls) \$245.

5. \$1425.

6. \$22.50.

7. \$5000.

8. 250 gallons.

9. A, \$80; B, \$90; C, \$100.

10. 15 ozs.

11. 2.

12. 3 horses=2 oxen.

13. \$18.

Exercise LXXXIV.

1. $\frac{1}{8}$.
2. $42.
3. $\frac{1}{2}$.
4. $\frac{81}{100}$.
5. 14 lbs. tea ; 36 lbs. coffee.
6. $63.75.
7. £65.
8. 637560.
9. A, $40 ; B, $60 ; C, 90.
10. 33.
11. $1.50.
12. $504.
13. 13064.

Exercise LXXXV.

1. £24 6s. 2d.
2. Wheat, 40 bushels ; barley, 60 bushels.
3. $100.
4. 30 rods.
5. 69 cents.
6. A, $60 ; B, $75 ; C, $90.
7. $122.20.
8. 6 ft.
9. $50.40.
10. $\frac{1}{4\,3\,8}$.
11. $45.
12. $7488.
13. $310.10.

Exercise LXXXVI.

1. 10 days.
2. $531.
3. 8 days.
4. $8.89.
5. 8 miles, 80 rods.
6. 6.
7. $79.
8. $90.
9. Each equals—64 sq. rods, 9 sq. yds., 5 sq. ft.
10. 9 hours.
11. 360.
12. $8\frac{2\,6\,9\,5}{2\,7\,3\,8}$.
13. $329.

Exercise LXXXVII.

1. 6 days.
2. 25 cents per hour.
3. A, $627; B, $2029 and C, $3443
4. $3\frac{1}{3}$ per cent. gain.
5. 693 bbls., 19 gals., 4 lbs., $9\frac{1}{3}$ ozs.
6. Rye, 70c. per bush. ; barley, 56c. per bush.
7. 750.
8. 11.30 o'clock p.m. (every $10\frac{1}{2}$ hrs.)
9. 31.
10. 9.
11. $140.
12. $14.40.
13. A, $81 ; B, $90 ; C, $108.

Exercise LXXXVIII.

1. 10 days.
2. 7.
3. A, \$32.20 ; B, \$16.10 ; C, \$48.30.
4. \$1.75.
5. \$38.40.
6. 300 feet.
7. $\left\{\begin{array}{l}\text{Oats, \$361.80}\\ \text{Wheat, \$990.99.}\\ \text{Barley, \$293.30.}\end{array}\right\}$ = \$1646.09.
8. 18 gallons, 2 quarts.
9. \$17.50.
10. 24 bushels, 27 lbs.
11. 1381400.
12. $\frac{1}{3}$.
13. A, \$350 ; B, \$420 ; C, \$560.

Exercise LXXXIX.

1. 3 years.
2. \$701.10 net.
3. 37 bushels, 24 lbs.
4. 41 cwt., 16 lbs.
5. 14 acres, 15 rods, 8 yards, 2 ft., 36 inches.
6. A, \$27 ; B, \$36 ; C, \$45.
7. \$7.00.
8. \$1510.00.
9. $131{,}384{,}009\frac{2601}{6111}$.
10. 6.
11. 3 cents.
12. 8 per cent.
13. Sum of quotients, 437.

Exercise XC.

1. 289.
2. (*a*) 6,414,408 ; (*b*) 185.
3. 80 pounds.
4. \$270.00.
5. \$945.00.
6. 55 cents.
7. 8 per cent.
8. \$820.00.
9. 39 animals.
10. \$7560.
11. First, \$21.60 ; second, \$18 ; third, \$15 ; fourth, \$12.50.
12. \$17.00 and \$8.20.
13. 84 inches.

Exercise XCI.

1. £95, 16 sh., 8d.
2. 36 cents.
3. \$290.00.
4. 8 dozen and 6 eggs.
5. 100 acres.
6. 18.
7. A, \$450.00 ; B, \$400.00 ; C, \$350.00.
8. 10 per cent.
9. 45 square yards, 1 square foot, 72 square inches.
10. 90 times.
11. 3.55 o'clock, p.m. (or it lacks 5 minutes of 6 o'clock, p.m.)

12. $\left.\begin{array}{l} 7560 = 2\times2\times2\times3\times3\times5\times7. \\ 8820 = 2\times2\times3\times3\times5\times7\times7. \\ 44100 = 2\times2\times3\times3\times5\times5\times7\times7. \end{array}\right\}$

Now the *smallest* selection of factors which contains the factors of each given number is :

$[(2\times2\times3\times3\times5\times5\times7)\times7\times2] = 264{,}600$ L.C.M.

And the *greatest* selection of factors common to these numbers is : $2\times2\times3\times3\times5\times7 = 1260$ H.C.F.

13. (*a*) 21 years ; (*b*) $745.

Exercise XCII.

1. $\frac{5}{6}$ of a ton.
2. 100 rods.
3. 1440.
4. 1089.
5. (*a*) 6048 ; (*b*) 112320.
6. 30 miles.
7. 6 miles, 240 rods.
8. $\frac{24\,5\,9\,5\,2}{6\,1} = 4032$ times.
9. $579.43.
10. 56 gallons.
11. $56.25.
12. $\frac{4\,0\,3\,2\,0}{3\,2} = 1260$ times.
13. 866.

Exercise XCIII.

1. 2640 dozen.
2. $\frac{1}{16}$.
3. $16,000.00.
4. $7\frac{1}{2}$ cents.
5. 40 barrels.
6. 15 acres.
7. $748.80.
8. James, $145 ; Andrew, $132 ; Robert, $119.
9. $20.90.
10. $42.00. (☞ Ceiling three times ordinary height.)
11. $264.00.
12. $17.00.
13. $15.00.

Exercise XCIV.

1. $\frac{1}{5}$ S.P. $= \frac{1}{5}$ C.P. $\therefore \frac{1}{5}$ of 80 yds. $= \frac{1}{6}$ of 9.60 yds. $= 10$c. $= \frac{1}{6}$ of $9.60.
2. 7101 sum.
3. 90 days.
4. $54.40.
5. £616, 1sh. = $2998.11.
6. 240 rods.
7. H, $550 ; L, $440.
8. $1950.
9. $27.00.
10. $20.59.
11. $182.
12. 11,948,160.
13. (*a*) 8289 ; (*b*) 25%.

Exercise XCV.

1. $405.00.
2. 84.
3. (*a*) Reduce them to fractions having a common denominator. (*b*) $\frac{31}{1755}$. (*c*) $\frac{7}{13}$, $\frac{72}{135}$, $\frac{34}{65}$.
4. 4,735,698.
5. 47 times.
6. 5 per cent.
7. 8 years.
8. $16.00.
9. 48 weeks, 3 days.
10. $87\frac{1}{2}$ cents.
11. 50,424,201.
12. $18.00.
13. (*a*) $20.75; (*b*) $9,441 + . . .

Exercise XCVI.

1. $160; 400 dozens.
2. $\frac{15}{68}$.
3. 2 miles, 263 rods, 1 yd., 2ft., 6 inches.
4. $24.00.
5. $12\frac{1}{2}$ per cent.
6. $14\frac{2}{7}$ per cent.
7. $630.
8. 4.
9. $\frac{25}{27}$, $\frac{5}{8}$, $\frac{7}{9}$, $\frac{59}{68}$.
10. 14.
11. $\frac{2198\frac{34}{49}}{2613}$.
12. 115 lbs.
13. (*a*) 25 per cent. (*b*) 12 lbs.

Exercise XCVII.

1. 2 miles, 99 rods, 2 yards, 0 feet, 6 inches.
2. 87120 times.
3. $339.57.
4. A, $1014; B, 2535; C, $3549.
5. $6.65.
6. (*a*) 12 acres, 80 rods; (*b*) $3250.00.
7. $6624.00.
8. $26.46.
9. 7 per cent.
10. 128,755.
11. $4\frac{3}{8}$ miles an hour.
12. $3.05.
13. A, $6.12; B, $5.10; C, $2.04.

Exercise XCVIII.

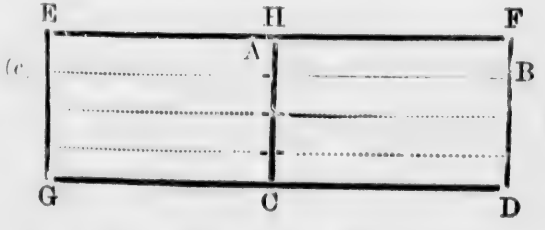
1. $34.15.
2. 3.
3. John $567 ; Robert $42.
4. $63.
5. 35.
6. $40,32.
7. $1300.
8. 5.
9. 411 miles, 266 rds, 3 yds, 2 ft.
10. $60.
11. $\frac{\text{L.C.M.}=840}{\text{H.C.F.}=15}=56$.
12. 4419.
13. $147.00.

Exercise XCIX.

1. 6.
2. $85.
3. $8.
4. L.C.M., $10\frac{1}{2}$; G.C.M., $\frac{1}{4}$.
5. 12 sq. rods.
6. 25 per cent.
7. A, $108 ; B, $144 ; C, $288.
8. 3 days.
9. 2 acres.
10. S., $420 ; T., 3 years.
11. $7\frac{1}{2}$ days.
12. $\left.\begin{matrix}\text{Papering, \$1.76}\\ \text{Painting, \$22.63}\end{matrix}\right\}=\$24.39$.
13. $91.01.

Exercise C.

1. (*a*) 13 (H. C. F.) ; (*b*) 7176 (L. C. M.)
2. $17.50.
3. *Product*, 69,610,086 ; sixty-nine millions, six hundred and ten thousand and eighty-six.
4. 350 tens ; 475 twenties.
5. 625.
6. 10 gallons.
7. $23.37\frac{1}{2}$.
8. (*a*) $25,600.00 ; (*b*) $21.40.
9. 13,689.
10.
11. (*a*) $\frac{3}{4}$ of $\frac{1}{2}$ of 1 ; (*b*) A compound fraction ;



Finish out, *dividing* the whole Fig. E G D F, so as to show it as composed of *eighths*; then, A C D B is *three* out of the *eighth*, eighths, or $\frac{3}{8}$ of whole Fig. E G D F.

12. A, $20 ; B, $60 ; C, $20.
13. $126.00.

Exercise CI.

1. $347.50.
2. 27 cows : $35 each.
3. $15.75.
4. 9·44+ . . . .
5. A, $4.00, B, $3.00, C, $2.00.
6. 6 per cent.
7. (*a*) Book-work. (*b*) A, 8 days, B, 15 days.
8. $180.00.
9. $276.00.
10. 25 cents.
11. 90 cents.
12. A $60.00, B $72.00.
13. 150 per cent.

Exercise CII.

1. 24 cents.
2. G.C.M. = 329 ; L.C.M. = 29610.
3. 20 cows.
4. 93.
5. 31 acres, 130 rods, 27 yds., 4 ft., 72 in.
6. $3.50
7. *Multiplication* : Ex. 42×73 73 taken *42 times as an addend* $=3066$. Multiplication is a *short form* of Addition.
8. $22.40.
9. $43\frac{7}{11}$ minutes past 12 o'clock.
10. ·16.
11. 7 dozen $\div 3+2=30$ marbles.
12. 30 days.
13. $425.00.

Exercise CIII.

1. $380.
2. $9\frac{1}{2}$ per cent.
3. 625 leaps.
4. £1291, 10 sh.
5. $10350 = 2\times3^2\times5^2\times23$.
   $113022 = 2\times3^3\times7\times13\times23$.
   $169533 = 3^4\times7\times13\times23$.

$\therefore$ L.C.M $= 2\times3^4\times5^2\times23\times3\times7\times13\times3 = 8{,}476{,}650$; and G.C.M. (or H.C.F.) $= 3^2\times23 = 207$.

6. (1) A, $70.20 ; B, $35.10 ; C, A, $67.80 ; B, $37.50 ; (3) The first mode is the better one for by $2.40.
7. 2 cwt., 24 lbs.
8. 1640 dozens.
9. 1 sq. rod, 16 sq. yards, 8 sq. feet, 54 sq. inches.
10. (*a*) $1\frac{1}{2}$; and (*b*) $\frac{43}{137}$.
11. 21 cents.
12. (*a*) $4.80; (*b*) $16\frac{2}{3}$ lbs. for a dollar.
13. (*a*) 17 ; (*b*) 49.

Exercise CIV.

1. 810 doz.

2. 6 tons, 1950 lbs.

3. (*a*) Integral, Prime, Odd, Abstract. (*b*) Fractional, Vulgar, Proper, Simple (representing 4 fractional units whose prime unit is one inch). Denominate.

4. 7 hours, 15 minutes.

5. $56.51 ; Receipt :

Burnside, May 13th, 1893.

$\$56\frac{51}{100}$.

Received from John A. Bruce, the sum of fifty-six dollars and fifty-one cents ($\$56\frac{51}{100}$) in full payment of account.

A. B. Burns & Co.

6. 24 sq. rods, 2 sq. yards, 2 sq. feet, 24 sq. inches.

7. £15, 15s. Sterling.

8. $90.

9. $30.25.

10. $198.76.

11. $1.50 an acre ; 128 acres.

12. 40 cents.

13. $4660.50.

Exercise CV.

1. A, $10.00 ; B, $2.40 ; C, $2.00.

2. 54 tons.

3. $32.

4. $266.70.

5. $19.65.

6. 240 trees.

7. 13.

8. 17323.

9. A, 3 miles ; B, 4 miles ; C, $4\frac{1}{2}$ miles ; D, 5 miles.

10. (*a*) The multiplicand. (*b*) The multiplier. (*c*) When both numbers are *abstract*. (*d*) $\left.\begin{matrix} 3\times4=4+4+4=12 \\ 4\times3=3+3+3+3=12 \end{matrix}\right\} \therefore 3\times4=4\times3$. (*e*) 6×7.

11. 1980

12. 240 barrels R.I.G's. ; 420 barrels N.S's.

13. ·0138.

Exercise CVI.

1. Q. 38984, Rem. 78 ; P. 37,050,342,912.
2. Q. 273, Rem 380.
3. A, $22.50 ; B, $24.00 ; C, $46.50.
4. A, $3200 ; B, $4000 ; C, $5040.
5. 105 lbs, 3 ozs.
6. Oranges, 36 cents ; lemons, 28 cents.
7. 200 acres.
8. 16 bushels.
9. 7 chains, 7 feet.
10. 64 cents.
11. 65 dozen.
12. $3\frac{3}{5}$.
13. $49.

FIFTH CLASS.

Exercise I.

1. 54 and 6.
2. $59.40.
3. 4.
4. 45 pairs.
5. 17187 tons, 1000 lbs.
6. 93 cents a lb.
7. $45.
8. 192 men.
9. $1000.00.
10. 24 miles an hour.
11. 60 cents.
12. L.C.M., 45 ; H.C.F., $\frac{1}{2}$.
13. 84 times.

Exercise II.

1. 54 miles.
2. 88 cubic feet.
3. $104.00.
4. A, $70 ; B, $42 ; C, $30.
5. 144 miles.
6. 70 bushels at 90 cents ; 130 bushels at 85 cents.
7. (*a*) $7\frac{1}{2}$ days ; (*b*) 15 days ; (*c*) $17.25.
8. 12 miles.
9. A, $40 ; B, $20 ; C, $40 ; D, $280.
10. $13\frac{5}{8}$ days.
11. 45 bushels @ 60 cents ; 75 bushels @ 80 cents.
12. 32 per cent.
13. 1987.

Exercise III.

1. $373.06 net.
2. 45 bushels.
3. $17.60.
4. $7.00.
5. 7 brooms.
6. 42 gallons.
7. 30 hours.
8. $\dfrac{345982 \text{ L.C.M.}}{1901 \text{ H.C.F.}} = 182$ times.
9. $72.00.
10. $\dfrac{107140644 \text{ L.C.M.}}{1807 \text{ H.C.F.}} = 59292$ times
11. $64.00.
12. $\dfrac{1493382 \text{ L.C.M.}}{1331 \text{ H.C.F.}} = 1122$ and $(1122)^2 = 1258884$.
13. 6 tons.

Exercise IV.

1. 21 lbs. chicory ; 7 lbs. coffee.
2. $4052.00.
3. $988.
4. £300.
5. $90 \times 90 = 8100$ product.
6. $2^{22} \times 3^4 \times 7 \times 11^2 \times 13^2 \times 17 \times 19 \times 23$.
7. (*a*) $2.88 ; (*b*) 60 per cent.
8. $2^9 \times 3^5 \times 5 \times 7^2 \times 11 \times 13 \times 17 \times 19$.
9. 106 feet, 4 inches.
10. Green, 16 lbs ; Black, 44 lbs.
11. 9 lbs.
12. 6 per cent.
13. 2 feet, 9 inches.

Exercise V.

1. $75.00.
2. $1875.00.
3. $1639.30.
4. $1752.00.
5. 28 sheep.
6. $100.00.
7. $1120.00.
8. (*a*) 515 ; (*b*) 5 quarts.
9. (*a*) 225 ; (*b*) 330.
10. (*a*) 12 apples ; (*b*) 8 pears.
11. $409.40.
12. $42.00.
13. 61·44 lbs.

Exercise VI.

1. 1st time, $9\frac{9}{11}$ minutes past IX o'clock ; 2nd time, $22\frac{2}{11}$ minutes past IX o'clock.

2. With the Romans, the symbols used maintained their relative values, no matter in what order they were written ; thus, IX stood for 11, and was read *eleven*, just as XI ; and XL stood for 60, and was read *sixty*, just as LX, etc. Their system of notation was by *units*, *fives*, *tens*, *fifties*, *hundreds*, etc., instead of *units*, *tens*, *hundreds*, etc., as in our system, the symbols being written in that order, and each one repeated in accordance with their system of notation—I and X might be repeated *four* times, but V or D would not be required to be repeated as two V's = X, and two D's = M,

etc., etc. In writing them down, place like symbols under each other, *i.e.*, units under units, fives under fives, tens under tens, etc.

(*a*)

DCC LX
CC XXXX
DCCC XXVIIII

MM CCC XXXXV sum.

(*b*)

MM L XVIIII
MDCC XXV

CCCXXXXIIII diff.

(*c*)

XXXX II
LXXXXV XXV

MMC
CCCC XX
CCCC XX
CCCC XX
CCCC XX
CC X

MMMDCCCCLXXXX prod.

(*d*)

MDCCC XXV(LXXIII quot.
M CCL

D LXXV
CCL

CCC XXV
CCL

LXXV
XXV

L
XXV

XXV
XXV

3. $7000.00.
4. 3 miles, 60 rods.
5. $5670.00.
6. $496.10.
7. $33.75.
8. 16 hours.
9. $5011.20.
10. Lose $4.50.
11. 270 sheep.
12. 117.
13. $233\frac{1}{3}$ per cent.

Exercise VII.

1. $20.
2. $40.
3. $45.
4. $60.
5. $7.
6. 8 dozen.
7. 63 gallons.
8. $77.
9. 12 per cent.
10. 31.
11. A, $48 ; B, $72.
12. $65.
13. 54 cents.

Exercise VIII.

1. $93\frac{83}{144}$ barrels.
2. 3636.
3. $31\frac{83}{432}$ quarts.
4. A, $200.00 ; B, $125,00.
5. $156\frac{1}{4}$ barrels.
6. 30 barrels, $18\frac{1}{2}$ gallons.
7. $108.
8. $1.00.
9. Principal, $350.00, time 5 yrs.
10. (*a*) $1.20 ; (*b*) $2.00.
11. $2.00.
12. Principal, $725, time, 7 yrs.
13. A, $27.00 ; B, $36.00 ; C, $45.00.

Exercise IX.

1. $825.00.
2. $500.00 ; $300.00
3. $24 ; $40.
4. $9.75.
5. 1444.
6. 4141.
7. 30 cents.
8. 60 per cent.
9. 90.
10. $\frac{1}{3}$.
11. $2.00.
12. (*a*) 15. (*b*) The 7th.
13. 49 yards, 2 ft., 5 inches.

Exercise X.

1. $180.00.
2. $1.80 an hour.
3. $501.00.
4. 21.
5. L.C.M. 250208595; Quotients, 6643, 3285, 4095 ; Sum, 14023.
6. A, $256.50, or $8\frac{1}{7}$ cents a lb. ; B, $96.30, or $7\frac{9}{14}$ cents a lb.
7. 24 days.
8. $514.50. (See P.S. arith., p. 88).
9. A, $560.00 ; B, $370.00.
10. A, $7400.00 ; B, $8400.00.
11. 15 miles.
12. 20 days.
13. 6455743577.

Exercise XI.

1. L.C.M. =289, 692, 179, 960, 656, 200, 943, 335, 120. (Test question.)
2. L.C.M. = 783,029,520.
3. $892.08.
4. (*a*) 8641 ; (*b*) 2801 ; (*c*) 98079; (*d*) 707; (*e*) 6041; (*f*) 2841; (*g*) 8056.
5. (*a*) 506 ; (*b*) 287 ; (*c*) 4547 ; (*d*) 4070.
6. $18.60.
7. $448.00.
8. $420.00.
9. 4 per cent.
10. 5 years.
11. $73.00.
12. 13 years.
13. A, $1690.00 : B, $1820.00 ; C, $1950.00.

Exercise XII.

1. $84.

2. (*a*) $777; (*b*) $950.

3. $364.

4. A, $81.75; B, $245.25; C, $654.00.

5. 5.

6. I. The number of equal parts (fractional parts) of the *prime* unit, 1 lb. II. The number of fractional parts (units) in the fraction. III. That the prime unit, 1 lb. is divided into *five equal parts*; the name of each part, the weight (in this instance) of each part or fractional unit. IV. 1 lb. V. $\frac{1}{5}$ of a lb., $\frac{2}{5}$ of a lb., $\frac{3}{5}$ of a lb., $\frac{4}{5}$ of a lb., ($\frac{5}{5}$ of a lb.) VI. The TERMS of the fraction. VII. Yes; because it is the *measure of a quantity.*

7. $5\cdot\frac{4}{5}$ inches.

8. $18,360.00.

9. 15th.

10. $\frac{9}{85}$.

11. 26; 27th.

12. 18 lbs.

13. (*a*) (1) Write out in succession, the MULTIPLES of these numbers:—

24:—24, 48, 72, 96, 120, 144, 168, 192, 216, 240, 264, 288, 312, 336, 360, 384, 408, 432, 456, 480, 504, 528, 552, 576, 600, 624, 648, 672, 696, 720, 744, 768, etc.

42:—42, 84, 126, 168, 210, 252, 294, 336, 378, 420, 462, 504, 346, 588, 630, 672, 714, etc.

Now we see, by inspection, the *common multiples* of these numbers, and of these *multiples* 168 is the least; therefore it is the L.C.M.

2. Write out *all* the *prime factors* of these numbers:—

$24 = 2 \times 2 \times 2 \times 3.$
$42 = 2 \times 3 \times 7.$

Now the L. C. M consists of the smallest (*least*) selection of *factors* that contains the factors of each given number; therefore the L. C. M. is $2 \times 2 \times 2 \times 3 \times 7 = 168$.

(3). 2) 24, 42
3) 12, 21
4, 7 L. C. M. $= 2 \times 3 \times 4 \times 7 = 168$.

(*b*) (1) All the measures of

(Factors).	(Co-factors).
96 = 1, 2, 3, 4, 6, 8.	12, 16, 24, 32, 48, 96.
240 = 1,2,3,4,5,6,8,10,12,15.	16,20,24,30,40,48,60,80,120,240.

Now the *common measures* are: 1,2,3,4,6,8,12,16,24,48, and 48, the *greatest* of these, contains all the other measures; hence it is the G.C.M

(2) Write out *all prime factors* of these numbers:

$$96 = 2\times2\times2\times2\times2\times3.$$
$$240 = 2\times2\times2\times2\times3\times5.$$

Now the greatest selection of measures (factors) common to these numbers is: $2\times2\times2\times2\times3=48$, the G.C.M.

(3) 96)240(2
192

48)96(2
96

0 ∴ 48 is the G.C.M.

Exercise XIII.

1. 960 men.
2. 32 per cent.
3. 5 dwts., $18\frac{8}{9}$ grains.
4. 33 days, 18 hours.
5. $15000.
6. (*a*) 20 hours. (*b*) At starting point. (*c*) A, 4; B, 7; C, 12 times round the island.

7. Reduce to decimals of same order, then divide as in long division, striking out a figure in divisor every division, instead of adding to the dividend by bringing down additional figures:

378·7878 . . . .)31666·666666 . . . .(83·6 Ans.
30303 03030 . .

1363636 . .
1136363 . . . .

22727272 . . . .
22727272 . .

8. 2·71828 . . .
9. 60 yds., and $1.50 per yd.
10. 2100 ft. by 1680 ft.
11. $6\frac{2}{3}$ per cent.
12. 89$\frac{7}{8}$.
13. (*a*) 5 ft., 6 in.; (*b*) F., $1200; S., $500.

Exercise XIV.

1. $3889.69.
2. $11664.00
3. 6 inches.
4. A, $5187.50; B, $2812.50.
5. (*a*) $\frac{1479}{5339}$ of an oz.; (*b*) $\frac{4132}{5339}$ of an oz.
6. 500 birds.
7. $85.25 gain.
8. 26 feet.
9. 210 miles.
10. 4.
11. £103, 4s, 1d.
12. 28 rods.
13. 1900 square yards.

Exercise XV.

1. 6 o'clock p.m.
2. $5\frac{5}{11}$ minutes to 7 o'clock p.m.
3. 9 o'clock p.m.
4. $40\frac{520}{1427}$ seconds after 4 o'clock.
5. $12\frac{876}{1427}$ seconds after 5 o'clock.
6. $29\frac{43}{73}$ seconds after 9 o'clock.
7. $56\frac{568}{697}$ seconds after 1 o'clock.
8. $51\frac{453}{697}$ seconds after 2 o'clock.
9. First time, $32\frac{8}{11}$ minutes after 8 o'clock; second time, $54\frac{6}{11}$ minutes after 8 o'clock.
10. 5 minutes too fast.
11. 6 minutes too slow.
12. 9 miles.
13. 24 minutes.

Exercise XVI.

1. 8 lbs.
2. 25 per cent.
3. 5 miles, 110 rods.
4. $33\frac{1}{3}$ per cent.
5. 20 per cent.
6. (*a*) B's time is to C's time as 14 : 9. (*b*) $1120, B's gain.
7. $11\frac{11}{19}$ per cent.
8. 12 per cent.
9. 40 cents.
10. 12 rods.
11. (*a*) 1842 lbs., $4\frac{9}{16}$ ozs. (*b*) 9 sq. ft., 90 sq. in.
12. Grapes, $30.00; apples, $40.50; cherries, $50.00.
13. $40.00.

Exercise XVII.

1. $11,520.
2. $180.
3. 18 acres, 120 sq. rods.
4. 30 children purposed going and 15 went.
5. 10 lbs., 2 ozs.
6. 8 per cent.
7. $\$18\frac{2}{11}$.
8. 25 per cent. gain.
9. 10 per cent.
10. 24000 bricks; and $6\frac{2}{3}\%$.
11. 6 boys.
12. 7033 and 9197.
13. $4800.

Exercise XVIII.

1. 3696 gallons (or 117⅓ bbls.)
2. 19.
3. 153,029,520, L-C.M.
4. 8 average men.
5. The circuitous, by $2.
6. 7½ gallons.
7. 36⅔ cents a bush., 35$\frac{11}{15}$ lbs. per bush.
8. Half-and-half; or 50 per cent. brandy.
9. $6240.
10. $1098.50.
11. A, $480; B, $240.
12. 14 inches.
13. 6 balls.

Exercise XIX.

1. 12 per cent.
2. $269.75.
3. 6⅔ per cent.
4. 3 hours, 8 min., 55$\frac{85}{269}$ sec.
5. Cash, by $50.
6. $7920, B. of C. Stock.
7. A, $750; B, $200; C, $315; D, $400; E, $210.
8. 385 cords.
9. $10.
10. $1000 M.; $600 W.; $480 B.
11. 10 per cent. discount.
12. 8 per cent. on former and 10 per cent. on latter.
13. (*a*) 70 cents; (*b*) 450.

Exercise XX.

1. $7776.
2. 66⅔.
3. $32,000.
4. $36.
5. 100 lbs. @ 45 cts.; 100 lbs. @ 60 cts.; 300 lbs. @ 90c.
6. £6, 6sh, 5d.
7. 30 casks.
8. 13 years.
9. 3 : 1.
10. 20$\frac{4}{7}$ min., 28$\frac{4}{5}$ min.
11. $50.00.
12. Total Com. $715.00; No. bbls. remitted, 4147.
13. 2160 balls.

Exercise XXI.

1. (*a*) Town clock 15 minutes slow; and (*b*) 10 miles.
2. 75 bushels.
3. 40 yards.
4. 3 feet deep.
5. 13 minutes, 52½ seconds.
6. 25,000.

7. $\dot{0}5652173913043478260\dot{8}6$. (5, the fourth remainder, is $\frac{1}{3}$ of 15 the second remainder; therefore $\frac{1}{3}$ of 6, the third number in quotient, is 2 which is the next figure to set down in the quotient, etc.)

8. A, \$102.20, B, \$58.40. C, \$54.75, and D, \$91.25.

9. \$600 and \$750, respectively.

10. A, \$14.70; B, \$42.00.

11. $x = \frac{2}{49} y$.

12. 1.

13. (*a*) \$4 and \$3.20 respectively. (*b*) Man's rate $7\frac{1}{2}$ miles an hour. Stream's rate $2\frac{1}{2}$ miles an hour.

Exercise XXII.

1. \$25.
2. 25 yards.
3. $260\frac{4}{7}$ yards.
4. 16 inches.
5. $1\frac{2}{3}$ per cent. (or \$1 a share).
6. 276.48 cubic inches.
7. $\frac{1}{2}$.
8. \$140.
9. (*a*) 31278 balls; (*b*) $\frac{425}{3584}$ of an oz.
10. 2850.
11. 2 miles an hour.
12. 6 balls.
13. A's, by \$840.00.

Exercise XXIII.

1. 1140.
2. 6015 gallons, 2 quarts, 1 pint.
3. 441 boxes.
4. \$3660 whole profit and \$2160 B's share.
5. (*a*) 80 cents; (*b*) $77\frac{1}{2}$ cents.
6. 41 gallons.
7. 203 cubic yards, 19 cubic feet.
8. $\$4.34\frac{4}{9}$.
9. $\frac{2}{3}$.
10. 4 cwt., 10 lbs., $2\frac{1}{2}$ ozs.
11. \$691.
12. \$20655.00.
13. 3 cubic feet, 514 cubic inches.

Exercise XXIV.

6. (*a*) $\frac{3}{2\frac{1}{3}}$. (N.B.—The *sum* of the numerator and denominator of the fraction, representing the simple interest forms the denominator of the fractions representing the true discount.) (*b*) \$465.75 simple interest.

7. (*a*) \$20; (*b*) \$1; (*c*) \$1.
8. \$308.
9. 6 yrs., 73 days, and 6 per cent.
10. $\$94.82\frac{4}{6\frac{8}{9}}$.
11. $3\frac{1}{2}$ years.
12. 5 per cent.
13. \$420.

Exercise XXV.

1. 2240.
2. 2 hours, 30 minutes.
3. 6 lbs. at 6 cents, 6 lbs. at 8 cents, 3 lbs. at 16 cents, and 2 lbs. at 19 cents (other sets of answers may be got).
4. $80 first, and $120 second.
5. $404.20.
6. A, $360; B, $270; C, $240.
7. 50 cents a lb.
8. $10.
9. 35 miles an hour.
10. $592.7393.
11. 120 lbs.
12. 16 and 25.
13. 88 yards.

Exercise XXVI.

1. $1600.
2. 12 per cent.
3. $330 and $1320.
4. $2703 and $8109.
5. $2090.90 (or $\$4.18\frac{9}{50}$ per bbl.)
6. $5520.
7. $\frac{1}{11}$.
8. $\frac{2}{25}$ of cost ($= \frac{2}{27}$ S. P.).
9. 25 per cent. (or $\frac{1}{4}$ of cost).
10. $144.
11. $4\frac{1}{6}$ per cent.
12. $13\frac{1}{13}$ per cent.
13. (*a*) $\$186.66\frac{2}{3}$; (*b*) 24 days.

Exercise XXVII.

1. 180 feet.
2. $1125.
3. $\frac{503}{803}$.
4. $3657\frac{1}{2}$.
5. $\frac{1}{5}$ per cent.; 80 cents on $100.
6. $180.
7. 91 yards.
8. (*a*) $\cdot 00\dot{4}76190\dot{}$; (*b*) $\cdot 1\dot{4}2857\dot{}$; (*c*) The *nature of the denominator* of the vulgar fraction to which it corresponds. If the denominator is made up of *no other factors* than 2's and 5's, the decimal will be finite; if either 2 or 5 with other factors, it will be a mixed repetend; if neither 2 nor 5, it will be a pure repetend. (*d*) *Finite* decimals; and *pure* and *mixed repetends*.
9. $28,350.00.
10. $17.16.
11. 437 reams, 10 quires.
12. 4 per cent.
13. (*a*) 24.75; (*b*) 36; (*c*) 4213; (*d*) 2807; (*e*) 5004; (*f*) 7610.

Exercise XXVIII.

1. L, 24 ft. ; B, 18 ft. ; H, 9 ft.
2. (*a*) $837.00 ; (*b*) $22\frac{38}{49}$ per cent. ; (*c*) $21\frac{2577}{3833}$ per cent.
3. $202.00.
4. 7 feet.
5. $8\frac{3}{4}$.
6. $5293.60.
7. 266 sacks ; 20 cents.
8. $946.80.
9. 19 cub. feet, 432 cub. inches.
10. $9000.
11. $2500 @ 5 per cent $3500 @ 7 per cent.
12. (*a*) $36\frac{12}{23}$ min. past 7 ; (*b*) 42 min. past 7.
13. A, 60 ; B, $75 ; C, $50 ; D, $30 ; E, $20.

Exercise XXIX.

1. 5 per cent.
2. $1400.
3. $2060.
4. $22.
5. Gained $105.
6. Gained $75.
7. 6400 bushels.
8. $600.
9. 89°40′.
10. $600.
11. 900 barrels.
12. 5 per cent.
13. 6 per cent.

Exercise XXX.

1. (*a*) £5, 8sh., 9d ; (*b*) $1.00.
2. 8648 square yards.
3. $1.00.
4. 1 square foot, 81 sq. inches.
5. 8 per cent. loss.
6. 13 sq. rods, 26 sq. yards, 2 sq. feet, 35 sq. inches.
7. 5 sq. rods, 5 sq. yds., 6 sq. ft.
8. 2 sq. rods, 19 sq. yds., 2 sq. ft., 116 sq. inches.
9. $159.25.
10. 15 metres.
11. $9000.00.
12. $602.98.
13. (*a*) 39 sq. rods, 11 sq. yds., 138 sq. inches ; (*b*) Product. 478,687,021,724,583,756; quotient, 53,593,500,996.

Exercise XXXI.

1. 25 lbs. for a dollar.
2. (1) 45 tons ; $535\frac{5}{7}$ bushels.
   (See P.S. Arith. p. 88).
3. 171 cwt., 92 lbs., 7 ozs.
4. $5\frac{1}{4}$ barrels.
5. 250 acres.
6. $6840 \div 8 = 855$.
7. 60867 feet.
8. $216\frac{2}{3}$ barrels.
9. \$126.
10. \$18,900.
11. \$80.
12. 14 gallons.
13. (*a*) 15 cents ; (*b*) 792 yards.

Exercise XXXII.

1. \$38.50.
2. 13.
3. 18.
4. 34 lbs., 11 ozs., 14 dwts., 9 grs.
5. 1620 lbs.
6. \$26.25.
7. 65.
8. 72 gallons.
9. $9\frac{1}{2}$ years.
10. \$126.
11. \$4800.
12. 50c. ; $\frac{1}{2}$ per cent.
13. $\cdot\dot{9}23076\dot{9}$.

After the first division we have 3 as remainder, which is one-fourth of 12, the numerator of the fraction ; now, complete the repetend from this point by reducing each remainder to *tenths* of the next lower order and dividing by 4, *e.g.* :—

$\frac{12}{13} = \cdot 9$, and 2 as *remainder* ; now 2 is $\frac{1}{4}$ of 12.
$\frac{1}{4}$ of 9 (first figure in decimal), etc.
$= 9 \div 4 = 2$ and 1 over,—$10 \times 1 + 2 = 12$.
$12 \div 4 = 3$ and 0 over,—$10 \times 0 + 3 = 3$.
$3 \div 4 = 0$ and 3 over,—$10 \times 3 + 0 = 30$.
$30 \div 4 = 7$ and 2 over,—$10 \times 2 + 7 = 27$.
$27 \div 4 = 6$ and 3 over,—$10 \times 3 + 6 = 36$.
$36 \div 4 = 9$ and 0 over, etc.
Dec. $= \cdot 92307692$, etc.
$= \cdot\dot{9}23076\dot{9}$.

(N.B.—The operation should be performed *mentally*.)

Exercise XXXIII.

1. $22.00.
2. $1040.
3. $42\frac{6}{7}$ per cent.
4. Focal date, April 0, 1887 ; Bal. due, Jan. 16th, 1887.
5. 4000 barrels.
6. 20 per cent.
7. £40, 10s., 6d.
8. 30034 square root.
9. $6\frac{11}{20}$; Rem. = Dividend − (Divisor × Quotient.)
10. 15 rods.
11. $1742.25.
12. 280 dozens.
13. $196.37 per acre.

Exercise XXXIV.

1. $1200.
2. B, $1200 ; C, $1700.
3. $14400.
4. $98.55.
5. 25 per cent. discount.
6. $280.
7. 28 lbs., 1 oz., 10 dwts.
8. 16 boys.
9. $48.44.
10. 66 cwt., 15 lbs.
11. 6 acres, 28 sq. rods, 15 sq. yds., 1 sq. foot, 18 sq. inches.
12. $93\frac{3}{4}$.
13. $6.00.

Exercise XXXV.

1. $29\frac{5}{7}$ per cent.
2. June 17th, 1893.
3. $5915.
4. $81.25.
5. $\frac{4}{7}$ per cent.
6. $53\frac{3}{4}$ cents.
7. 303 lbs., 12 ozs.
8. $350.
9. 49 lbs.
10. 1188.
11. 225 miles.
12. $820 ; $8200.
13. $300 first ; $240 second.

Exercise XXXVI.

1. $108.64.
2. $20,000 ; $225,000.
3. $990.
4. Bal. due Nov. 25th, 1892. (Focal date, Dec. 0, 1892.)
5. $1600.
6. $10,000.
7. $1012.50.
8. 46 and 40.
9. $79.50.
10. 90 cents.
11. 72.
12. $80.96.
13. $3930.

Exercise XXXVII.

1. $490.
2. 2 ozs., 2 dwt., 14 grs.
3. $103.90.
4. 25 times: 3 hours, 30 min.
5. $52.02.
6. 1400 miles.
7. ·020024016008964608.
8. $3.
9. $108.
10. 2 Metres.
11. 153 M., 6 dm.; **$115.20.**
12. 6·650365952.
13. **$900.**

Exercise XXXVIII.

1. $1.00.
2. ·00946044921875.
3. $960.
4. A, $80; B, $120; C, **$160.**
5. 1 Kl., 4 Hl., 5 Dl., 2 L., 145 Mg., 2 Kg.
6. **$2475.**
7. 5 Dg., 7 G., 9 dg., 2 cg., 1 mg.
8. 68 Kg.
9. Compound Rules; **1 cubic** metre (volume or capacity) = 1 gramme (weight), or capacity : weight :: 1 cu. cm. : 1g.
10. 46·
11. $47·754 interest; **$297·754** amount.
12. 23.
13. **$1560.**

.20.

1 cubic
pacity)=
or capa-
m. 1g.

$297·754